DEPARTMENT OF THE INTERIOR—U. S. GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

# THE PRIEST RIVER FOREST RESERVE

BY

JOHN B. LEIBERG

EXTRACT FROM THE NINETEENTH ANNUAL REPORT OF THE SURVEY, 1897-98
PART V, FOREST RESERVES—HENRY GANNETT, CHIEF OF DIVISION OF GEOGRAPHY AND FORESTRY

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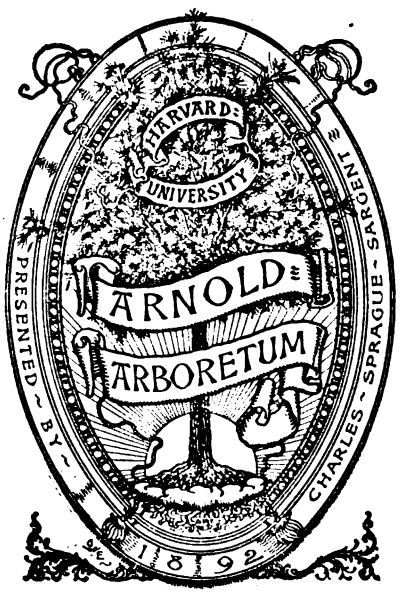

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## INTRODUCTION.

The data on which this report is based were in part obtained during several preliminary trips along the eastern and southern portions of the reserve during the months of May and June, and in part during the month of July and the first half of August, 1897, when the reserve was traversed from north to south along three different routes, with frequent crossings from east to west.

In a region so difficult of traverse as the Priest River Reserve, and without areal surveys to guide in determining superficial contents of the several tracts, it is not to be expected that every small subdivision has been examined in detail in the brief time allotted to the work, nor that the average estimate is absolutely exact. A general summary of the conditions is all that has been attempted. It is believed, however, that all estimates are conservative and approximately correct. An absolutely accurate account can not be had until the entire area shall have been surveyed and subdivided, and each quarter section successively examined—a labor that, even on the comparatively small area embraced within the limits of the reserve, would require the work of several seasons.

## TOPOGRAPHY.

The Priest River Forest Reserve as at present delimited consists of the drainage basin of Priest River, a stream having its ultimate head at or slightly beyond the forty-ninth parallel and flowing in a southerly direction to a junction with the Pend Oreille River, together with a small area in the immediate valley of the Pend Oreille. It is situated mainly within the borders of the State of Idaho, in Kootenai County, a small portion of the western area extending beyond into the State of Washington.

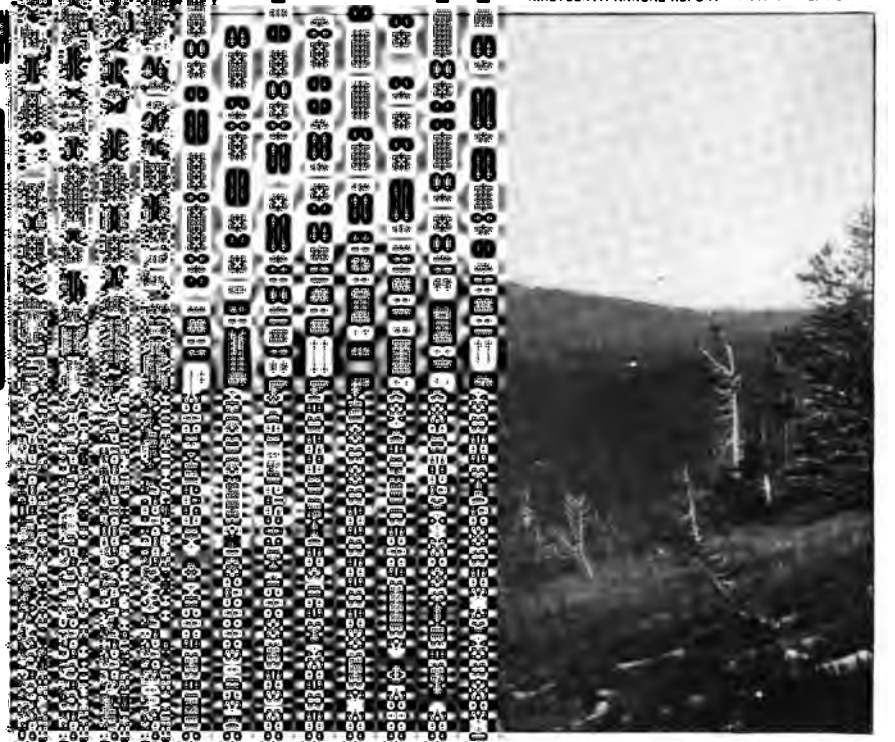
It is essentially a mountain region, the flat or approximately level tracts probably not forming more than 12 to 14 per cent of the whole. In elevation it varies from 2,000 to about 8,000 feet, the mean being about 3,800 feet above sea level.

The long diameter of the basin is from south to north, being rather more than 55 miles; the short one, from east to west, has an average

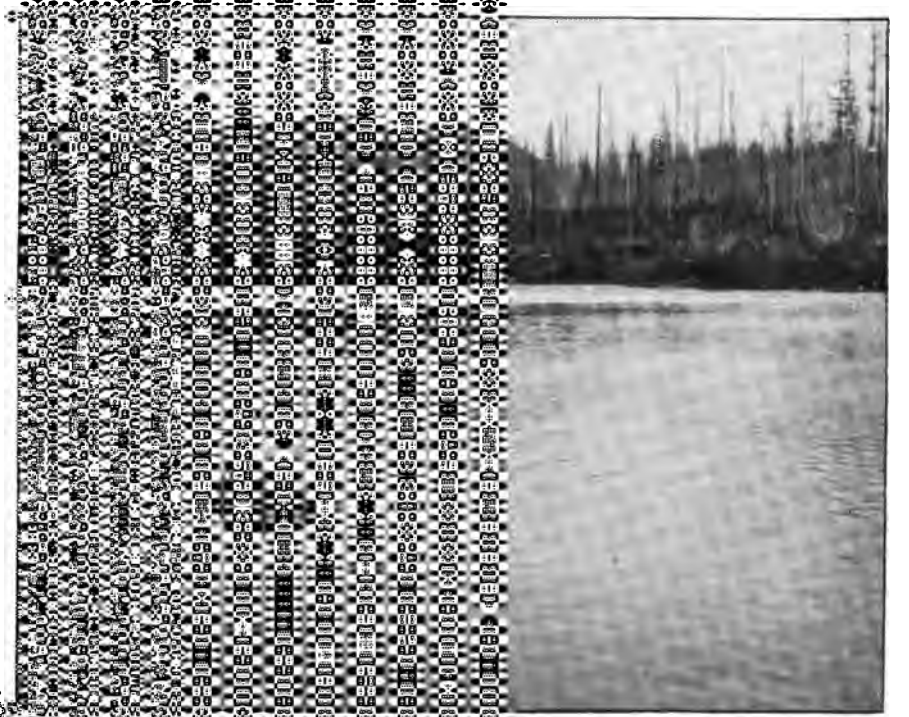
width of about 20 miles. Its position presents a broad opening toward the south and southwest, an ideal one in this region to insure a heavy yearly precipitation over the entire area, and as a result a dense forest growth. The region is limited on the east and west by two north-south mountain ranges, which converge at their northern extremities and form the head of the basin, but recede from each other toward the south. The eastern range is here named the Priest River Range; the western one the Pend Oreille Range. From each of these primary ranges secondaries project far into the basin, and by repeated subdivision nearly fill it with a rugged mass of spurs and ridges.

The Priest River Range is the loftier. Its central regions are the most elevated; the sinuous crest line of the backbone maintains an altitude between 5,000 and 6,000 feet for the greater portion of its length, rising in some localities to about 8,000 feet. Its rock formation consists of hard but much fissured granites and syenites, with occasional areas of slates and gneisses along the southern extremity. It has been deeply sculptured and eroded by glacial action, creating deep canyons and wearing the crest in many localities to a mere narrow margin between great precipices on either side.

The Pend Oreille Range, which incloses the basin on the west, forms the divide between Pend Oreille and Priest rivers. It is much less rugged than the Priest River Range and has a less elevated crest line, rarely rising above 6,000 feet. It is mostly composed of schistose rocks, traversed more or less by granitic extensions from the eastern areas. Owing to the softer materials composing its rocks, the lines of erosion are more rounded, presenting longer slopes that incline toward the central depression with angles much less acute than is the case with the Priest River Range. The troughs between the lateral ridges are broader, less canyonlike, forming flat, often swampy valleys with lake-like expansions that occasionally hold small ponds. The diversity in rock formation, with consequent unequal sculpturing and erosion, divides the basin into two areas with very dissimilar topographical features and of different degrees of economic importance. The present shape of the basin is largely due to the pressure and wear of a large glacier that once filled the basin. It appears to have originated in the high eastern range, moving thence toward the west, and eventually sliding southward into the Pend Oreille Valley. The hard granitic areas on the east were cut into steep spurs and narrow, deep canyons, while the softer schistose ridges on the west, offering less resistance, were extensively ground down and the depressions between them filled with glacial débris, forming broad flats and valleys. Upon the permanent recession of the glacier a lake occupied a large portion of the basin, submerging the low areas, depositing a lacustrine sediment, and thereby further smoothing out the surface of the valleys. The lake has gradually dwindled in size, due in part, perhaps, to the removal of a terminal moraine at the south end of the basin, in part, certainly, to the channel excavated by Priest River to its junction with the Pend Oreille



[illegible] DIVIDE LOOKING WEST.



[illegible] FROM LOWER PRIEST LAKE.

through the mass of glacial débris along its course, and in part, not unlikely, to a continued uplift of the rocks forming the basin. Since the disappearance of the glacier and after the rapid drainage began, the valleys have been more or less excavated by their shifting drainage channels, causing the terraced formation which we now find.

The drainage system of the basin consists of Priest River, the principal stream, with several large forks and numerous smaller tributaries as feeders. The two upper main forks of the river are about 10 miles in length. They head partly in the angle of convergence formed by the two great north-south divides that inclose the basin and partly in the northern portion of the west range. The western of these forks is named Gold Creek; the eastern is considered as the upper portion of Priest River. About 3 miles below the junction of the two forks the stream enters Upper Priest Lake, a shallow sheet of water about 2 miles long and 1 mile wide. At its southern end it is connected with Lower Priest Lake through a somewhat tortuous channel, named the Thorofare, about 2 miles long and varying in width from 75 to 120 feet. A sluggish current runs through this channel, which has a depth of 2½ to 12 feet at medium stage of water. Lower Priest Lake is about 18 miles in length and from one-half to 5 miles in width. Its position is nearly on the dividing line between the two rock formations of the basin. The eastern shore is bold and rocky, rising rapidly by steep encarpments and spurs to the summit of the main divide. The spurs and ridges that form the western shore are mostly low and are broken at frequent intervals by broad valley openings and swampy areas stretching westward. The lake serves as a central reservoir and receives about 65 per cent of the entire drainage of the basin. There are no data obtainable as to its depth. The deepest portion is evidently east of the center line. Numerous shallow gravel, sand, and bowlder bars project far out from the western side, especially at the outlet of the various creeks. The lake contains six islands. Three of these are merely the projecting tips of rock spurs still submerged. The others are larger, but none are of any economic importance. The outlet of the lake is by Priest River, which leaves it at the southwest corner through a channel about 400 feet wide and averaging about 3 feet in depth at medium stage of water. The course of the river to its junction with the Pend Oreille is generally southward, with a length of about 32 miles. A number of tributaries enter along the way, the most important being the upper and lower West Forks from the west and the East Fork from the east.

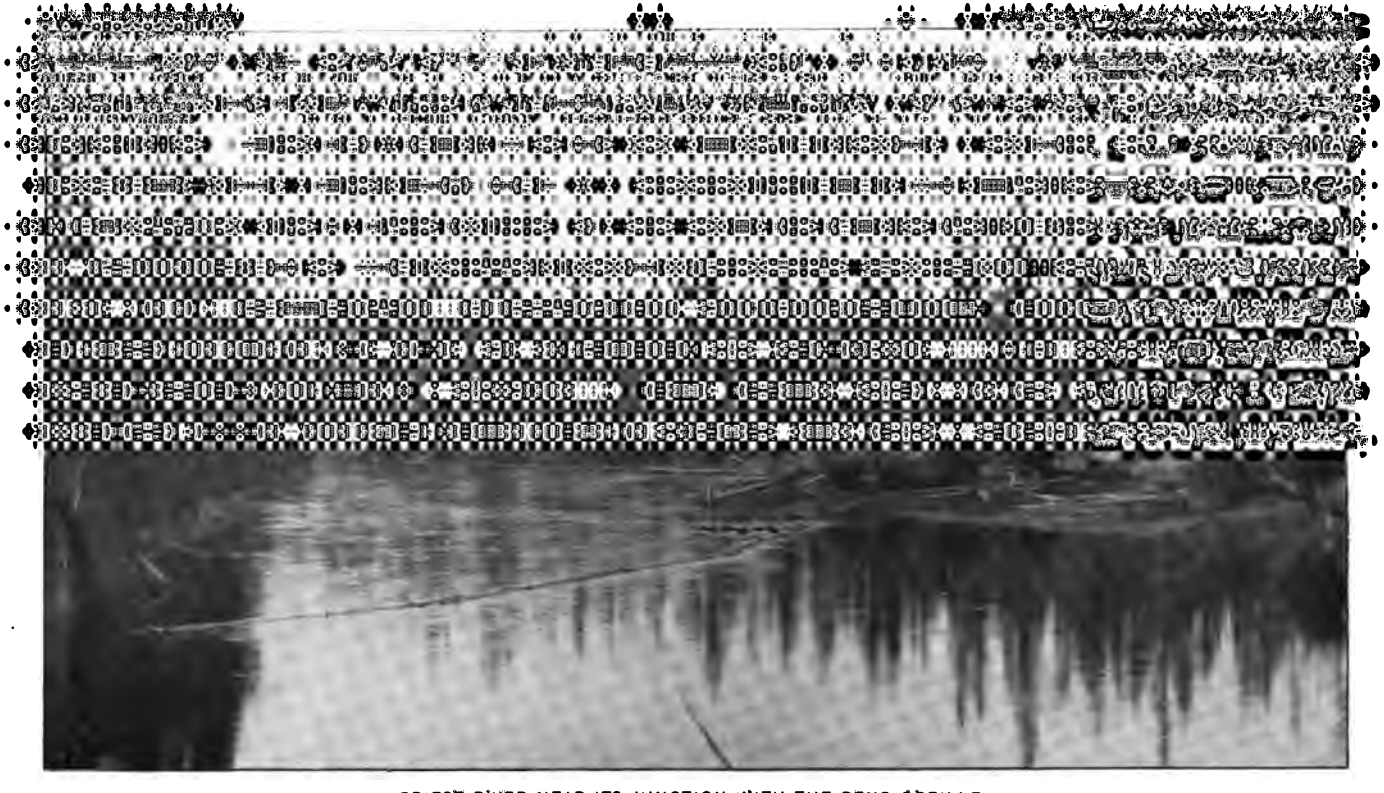
The current is swift, especially in the lower one-third of its length, where there exists a series of rapids extending a distance of 7 miles. These rapids are mainly due to huge bowlders dropped into the bed of the river by its excavation through the moraine material. The total fall in the river from the outlet in the lower lake to its junction with the Pend Oreille is about 600 feet. At the point of junction, or about one-third of a mile above, it is nearly 300 feet wide, with a depth in mid-

channel of about 7 feet at its summer stage and a current of between 2 and 3 miles an hour. The valley of Upper Priest River is a mere narrow canyon for about 10 miles of its length, as is that of its principal upper fork, Gold Creek. Below the junction of this fork to the head of the upper lake the river flows through a low swampy valley about three-fourths of a mile wide.

The valley below the lower lake has a width varying from about 2 to 4 miles. Low isolated ridges rise here and there, their bases buried in the mass of glacial detritus that has filled up the inequalities and approximately leveled the area that now constitutes the valley. Through this mass of transported material the stream has cut its way, excavating a channel that at the present time varies from 20 to 150 feet in depth from the water line to the top of the inclosing banks.

## WATER SUPPLY.

The reserve is situated within one of the zones of heavy precipitation in northern Idaho. Just how great the annual precipitation is we do not know, no data being obtainable in regard to it, but that it is exceptionally heavy is proved by the enormous development of the arborescent flora of the region. It is probable, however, that it lies between 50 and 60 inches for areas under 3,500 feet elevation above sea level, and from 60 to 90 inches for those above that altitude. The depth of snow on the ridges at 6,500 to 7,000 feet elevation varies from 12 to 20 feet, as indicated by marks on standing trees. Considering the extremely wet nature of northern Idaho snows, 80 to 90 inches is probably rather under than above the actual annual precipitation at these heights. The water of precipitation is discharged slowly into the streams. The granitic rocks of the eastern range are much broken and fissured, permitting the water to sink freely and emerge as springs at lower elevations. There is a permanent snow line on the northern slopes in the central sections of the range, but the amount of snow retained through the summer is not large enough to affect materially the water supply. Many of the streams that head in the range expand into semicircular basins near their heads. Some of these basins contain small ponds; others are partially filled with great masses of slidden rock which retain large quantities of water. Owing, however, to the precipitous nature of the range, and the short distance between the summit and the lake basin, the drainage is too rapid on the whole, and but one stream of considerable size, the East Fork, heads in the range. The streams that enter the lake and river from the west are longer and carry a greater volume of water. Their heads are at greater distances from their points of discharge, and, flowing through valleys with but little slope, their currents are rather sluggish. Many of them head in large marshy or springy tracts, and in their course are frequently interrupted by large timbered flats or low swampy meadows or sphagnous bogs. These flats and bogs are important conservators and regulators



PRIEST RIVER NEAR ITS JUNCTION WITH THE PEND OREILLE.

of the water supply of the basin. The flow of water in the basin is apparently not subject to very violent fluctuations. The difference between high and low water in the lake is said to be but 5 feet. Whether the present condition of the forest in the region affects the drainage as compared with the flow of water in the past, when different conditions existed, can not be learned, as the observations extend back only seven years. I am of opinion, however, that the spring freshets are greater than formerly and the summer stage of water less.

The water in the streams and lakes is not utilized in any way at the present time. The existing agricultural interests are small, and irrigation has not been found necessary for their maintenance, nor are there within the reserve any industrial enterprises that require water power. All the larger streams that enter the lake and river from the east have volume and fall sufficient to furnish great quantities of power, a few from the west could be utilized in the same way, and the main Priest River, especially below the rapids, is capable of supplying enough for all enterprises likely to be located within the reserve for generations to come. There appears, so far, to be but one location for purposes of power on any of the streams. This is at Blue Creek, about one-third mile above its junction with Priest River. The creek here runs over a ledge of outcropping rocks, forming a series of falls and rapids with a total descent of between 30 and 40 feet.

## SOIL.

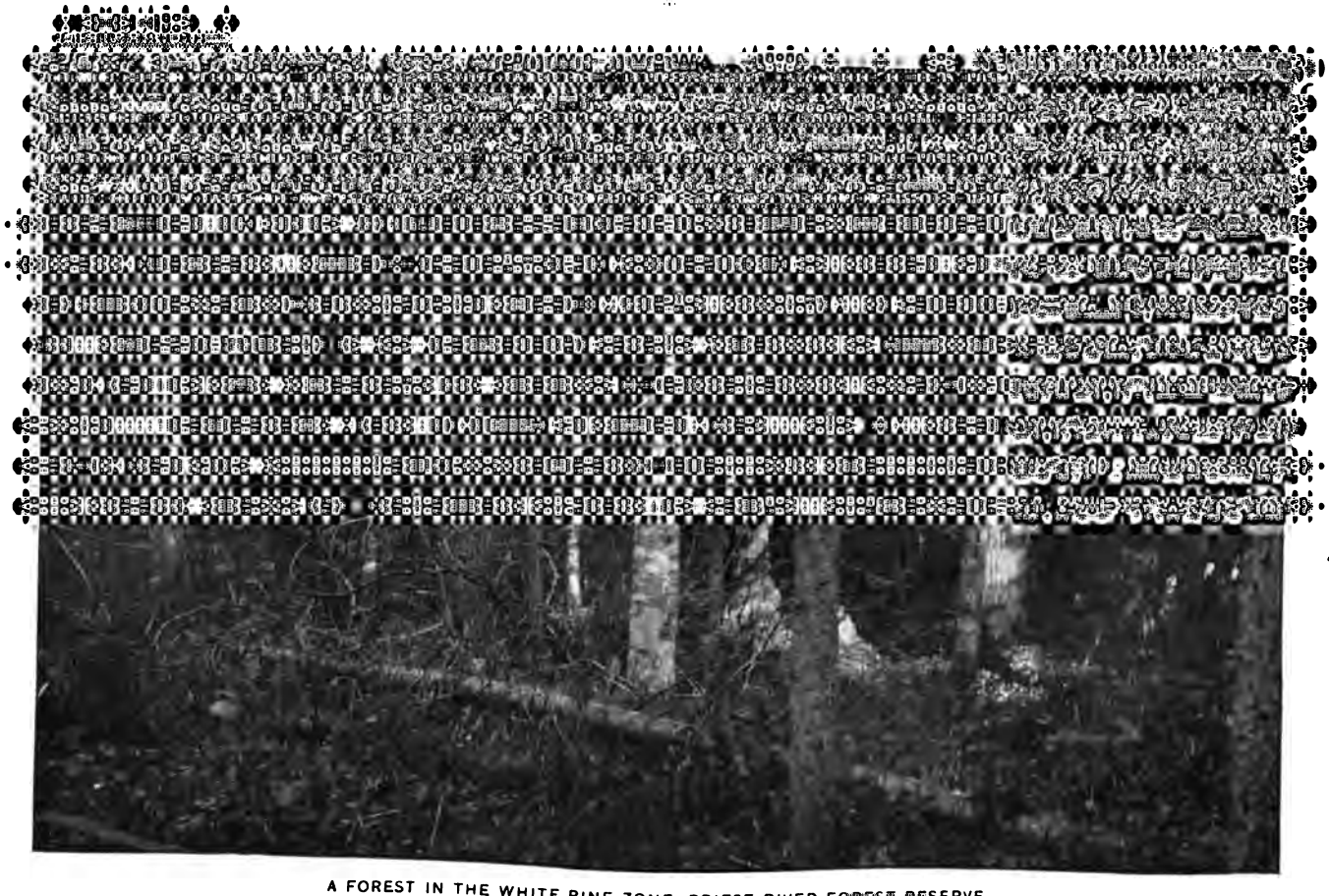
The soil of the basin varies considerably with location and elevation. In the eastern half of the basin, where the underlying rock is largely composed of hard quartzose granites, the soil is very siliceous. The softer schistose formations of the western half have yielded a soil with less silica and more magnesia and alumina. The soil on the summit of the main ridges, spurs, and upper slopes is a coarse gravel or sand thinly mixed with mold derived from ages of decaying forest growth, usually but a few inches in depth and resting on a substratum of still coarser fragments of rock or bowlders. The lower slopes and bottoms of the canyons heading in the eastern range are covered with masses of bowlders and slidden rock fragments, more or less cemented together by stiff clays and overlain by thick deposits of black mold and humus, in part accumulations washed down from the heights above. The low-lying broader and less sloping valleys on the west, together with the main Priest River Valley, have a subsoil wholly made up of glacial detritus, consisting in some localities of stiff, impermeable, gray, or extremely ferruginous clays, but mostly composed of fine or coarse gravel. The depth of this subsoil is unknown. It is commonly topped off by several feet of lacustrine silt, on which rests mold and humus of varying thickness, from 3 or 4 inches to 15 or 20 inches. The marshy flats or meadows occurring in the western half of the reserve are often the result of beaver dams, constructed ages ago when the animals were

plentiful and worked comparatively undisturbed. Owing to the more rapid growth and decay of vegetation on such tracts, there is a greater accumulation of mold than elsewhere, and it is also more fertile. The fertility of the soil resides largely in the superficial layer of mold and humus. When stripped of this the underlying silt deposit comes into view. While not so siliceous as the soils of the granitic half of the reserve, it contains too much silica to be classed as a prime soil for agricultural purposes. One chief drawback is its failure to retain moisture, losing it rapidly both by evaporation and by percolation. When, therefore, denuded both of its forest covering and the top layer of humus, the soil is apt to become quite sterile, owing to aridity. The soils on the small portion of the reserve that abuts on Pend Oreille River are mostly similar to those of the Priest River Basin proper. Exceptions are found on lands periodically overflowed, which are covered by a slimy subalkaline mud deposited from the waters of the river.

## FOREST CONDITIONS.

The Priest River Basin is essentially a forest-covered region. There are but few tracts within its boundaries that do not now, or did not a few years ago, support a dense, magnificent forest. The areas destitute of forest from natural causes are the low marshy expanses and sphagnous bogs along certain of the water courses, and rocky crests and slides of the main divides and of their higher laterals. Of the entire land area within the reserve, I estimate that about 3.5 per cent is naturally devoid of forest. Assuming that lakes and streams of the reserve cover in the aggregate about 30,000 acres, and that the entire reserve consists of 650,000 acres, we have a trifle more than 7.9 per cent deforested through the operation of natural causes. It would be possible to reclaim about 2.5 per cent of this by sylvicultural means, leaving but 5.4 per cent permanently timberless. The distribution of the timberless areas is nearly equal for each of the two divisions of the reserve, but their respective situations are diametrically opposite, for while the timberless tracts that exist in the western half are mainly grassy marshes at low elevations, those of the eastern half are regions of bare rocky expanses along the upper slopes of the divides.

The forest growth on the reserve is composed of sixteen species of trees that are always arborescent, and seven that are either small trees or shrubs, depending on soil and altitude. (See tables, p. 244.) Eleven of the trees are gymnosperms, or cone bearers; ten are evergreens; one, the larch, deciduous leaved. Five are angiosperms; three belonging to the willow and two to the birch family. Nine belong to the species commonly utilized as lumber trees, seven being conifers, two cottonwoods. Ninety-nine per cent of the lumber trees are comprised in five species, namely, western white pine, western larch, hemlock-spruce, cedar, and yellow pine. Of these, the white pine and tamarack (the larch) form about 91 per cent of the total. The distribution of



A FOREST IN THE WHITE-PINE ZONE, PRIEST RIVER FOREST RESERVE.

the arborescent flora lies within three of the western forest zones, the zones (1) of the yellow pine, (2) of the white pine, and (3) of the subalpine fir.

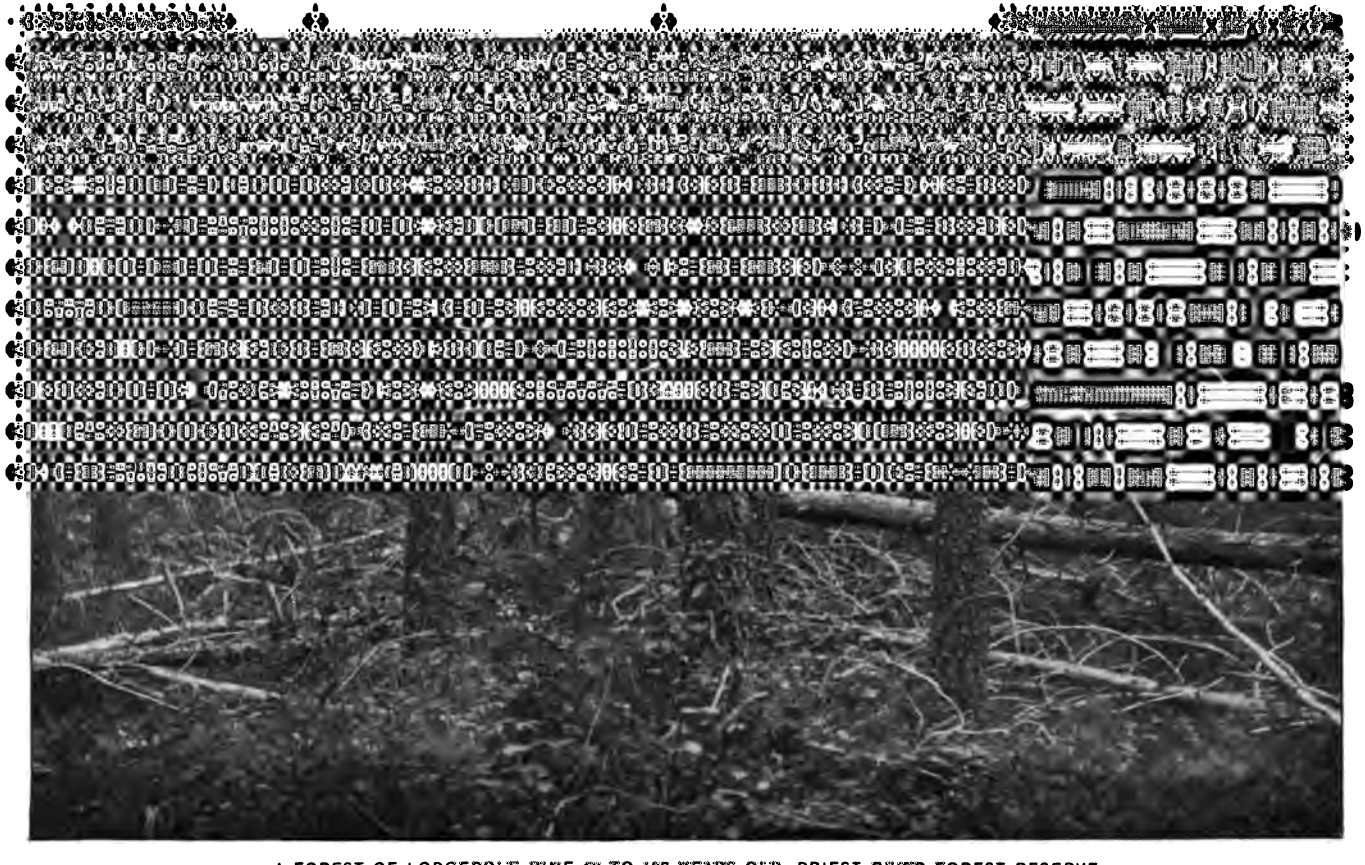
The zone of the subalpine fir comprises, in general, the ridges and slopes above 4,800 feet elevation. It follows, however, many of the smaller streams and the northern slopes of the ridges to lower altitudes, in such cases mingling with the white-pine zone. It covers about 10 per cent of the reserve area, or about 60,000 acres in the aggregate. The best development of the zone occurs on the summits, slopes, and higher portions of the canyons of the eastern or Priest River Range. It is found likewise on many of the spurs that extend into the basin from both the eastern and the western divide. It is less prevalent on the summits and slopes of the Pend Oreille divide, and has there a greater admixture of species from the zone below. Of the total area included within the zone, 7 per cent, or about 42,000 acres, is situated in the eastern half of the reserve, and 3 per cent, or about 18,000 acres, in the western half. The difference in development of the zone between the eastern and western portions of the basin is owing, in part, to the greater height of the Priest River Range, with the consequent increase in precipitation and lowering of the mean annual temperature, and, in part, to the difference in rock formation. The granites of the eastern range, with their extensive fissuring and no definite cleavage, hold precipitation far better than the schistose rocks of the western range, which are either water-tight or else afford a more or less rapid drainage along their cleavage, depending on their angle of inclination. The characteristic trees of the zone are the subalpine fir and white-bark pine. (See tables, p. 244.) According to the direction of slope exposure, there also occur the Engelmann spruce, the red fir, the lodgepole pine, the western white pine, and the tamarack, together with the American aspen. About 98 per cent of the forest growth of the zone is composed of two species, the white-bark pine and the subalpine fir, about 28 per cent of the former and 70 per cent of the latter. (For range in sizes see table, p. 246.) This zone possesses but little economic importance. The trees that form the bulk of it are not commonly utilized, and its considerable altitudes make it inaccessible to the lumberman.

The white-pine zone is the predominant one in the reserve. It lies principally between altitudes of 2,400 and 4,800 feet above sea level, and reaches its greatest development between elevations of 2,800 and 3,500 feet. Its area is about 80 per cent of the forested portion of the reserve, or about 480,000 acres, including such tracts as are now in a state of reforestation and covered with pure, or nearly pure, growths of lodgepole pine. The principal species of trees growing within the zone are the western white pine, tamarack, cedar, Engelmann spruce, Merten hemlock, and white fir. Mixed with them are scattered individuals of the red fir, cottonwoods, birches, and semiarborescent willows. The western white pine and the tamarack are the chief

components of the zone, forming about 77 per cent of the entire growth, western white pine constituting about 42 per cent and tamarack about 35 per cent. (See tables, p. 246.) The heaviest growth of the zone occurs on the level areas bordering the principal streams. The white pine is therefore more abundant in the western half of the reserve and along the Lower Priest River than elsewhere. Some of the stream bottoms in the southeast corner of the reserve, opening into the Pend Oreille Valley. have also considerable bodies of it. The region of the white pine is the most important in the reserve from an economic standpoint. It contains by far the largest quantity of commercial timber that exists on any of the growing areas.

This zone is generally easy of access, and, if the natural conditions of soil and humus are not disturbed, is capable of maintaining and of rapidly producing a heavy forest growth. The zone is remarkable for the prodigious development of its two principal components, the white pine and the tamarack, surpassing in density any other area of similar composition in the West. Two stages of growth occur in the commercially valuable bodies of this timber. They are the "old growth" and the "second growth." The former ranges in age from 250 to 400 years, the latter from 100 to 250. The old growth is found as small, scattered groves throughout the reserve, but in a large block only in the main Priest River Valley below its junction with the East Fork. It forms here a tolerably compact body of about 2,500 acres, with extensions up several of the adjacent canyons on the east amounting to about 1,000 acres more. The total area of the old growth is approximately 10,000 acres. The second growth was well developed in all portions of the reserve up to within the last thirty years. At the present time the heaviest bodies exist in the valleys of the Upper and Lower West Forks, especially in the latter. (For relative sizes of trees, see tables, p. 247.) The zone is not so well defined as that of the subalpine fir. Along its upper limits it contains more or less subalpine elements, and at its lower limits trees from the zone of the yellow pine. The only species of tree within the reserve not found in the white-pine zone is the white-bark pine.

The zone of the yellow pine occupies mostly a lower position than that of the white pine. It is not generally possible, however, to draw a well-defined line of demarcation between the upper limits of one and the lower limits of the other. The two zones overlap constantly, depending largely on soil and moisture conditions. The main components of the zone are the yellow pine, red fir, and white fir, in about the following proportions: Yellow pine, 10 per cent; red fir, 70 per cent; white fir, 15 per cent. (See table, p. 246.) The altitudinal limit of the yellow pine as a commercially valuable tree on the reserve is under 3,500 feet above sea level, while the red fir readily ascends to elevations of 4,500 feet on the slopes fronting on the south, west, and east. The area covered by this zone is about 10 per cent of the forested portions of the reserve, or about 60,000 acres. It is therefore



A FOREST OF LODGEPOLE PINE 60 TO 100 YEARS OLD, PRIEST RIVER FOREST RESERVE.

equal to the area of the subalpine zone, and, as a whole, is more equally distributed between the east and west halves, about 4.7 per cent being in the former and 5.3 per cent in the latter division of the reserve. There is, however, a marked difference in the distribution of the yellow pine and the red fir, the pine predominating in the eastern half and the red fir in the western. The commercially valuable areas of yellow pine are much scattered. There are small tracts of it along the eastern shore of Lower Priest Lake, and some scattered growths facing the south and west on the rockier spurs that come into the main valley from the east below the lake. The largest bodies of it are found in the southeast quarter of the reserve, but are not continuous over any considerable area, as most of the canyons which radiate from the main valleys carry the white-pine zone in their bottoms. The tracts which are covered with commercially valuable hemlock-spruce occur all over the reserve below the upper altitudinal limits of the zone to which they belong. The largest continuous growth of the species occurs, or rather occurred, along the summits and slopes of the southern portion of the Pend Oreille divide, before the forest fires had done their work in that locality. The yellow pine is, on the whole, more difficult of access than the white pine, due to its habitat upon the rocky slopes and benches.

## ASPECT OF THE FOREST.

The appearances of the growing forest are different for each of the zones, and several varying aspects occur in each subdivision; but as like conditions have produced them, they are quite uniform throughout the reserve. There are no forests of pure growth on the reserve, the nearest being the forests of the subalpine zone, and the tracts covered with lodgepole pine, within the limits of the white-pine region.

The subalpine zone presents four chief features. The first and most typical consists of a forest of medium density—300 to 400 trees to the acre. The trees are mostly straight and symmetrical. There is but little underbrush, the ground being covered with low shrubs of species of huckleberries, or with a growth of alpine sedges or junci, or, as is generally the case, with a dense sward of the common bear grass (*Xerophyllum tenax*). Litter is scanty, consisting of a few broken branches or tree tops. Humus is either wholly absent or but 2 or 3 inches in depth. Forests of this character are found on the ridges and slopes, mostly above 5,500 feet elevation, and represent the mature but still vigorous subalpine forest.

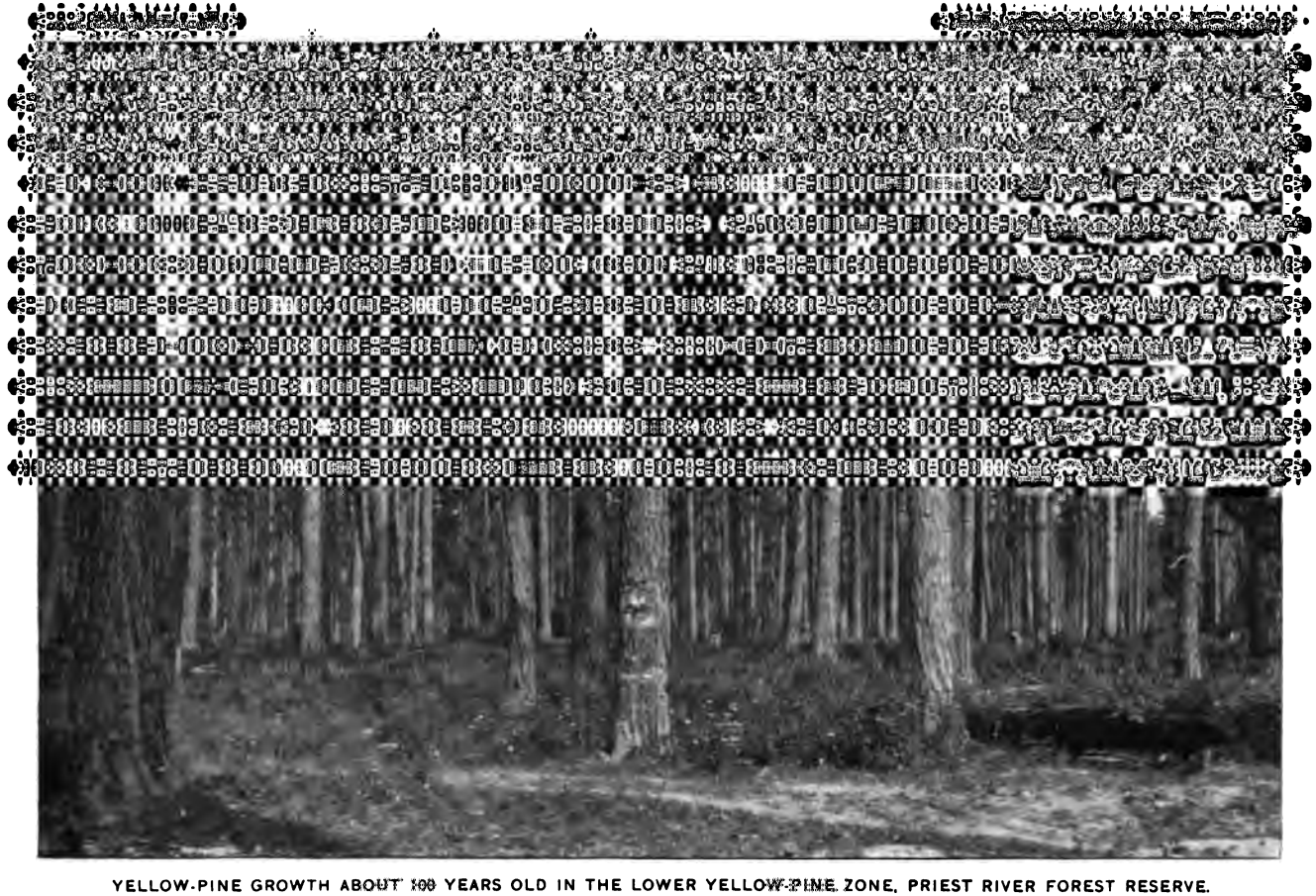
The second aspect is that of a forest of great density—1,000 to 2,000 trees to the acre. A tract of this character is usually littered with vast quantities of broken and dead trees, dead branches, and growing brush, consisting in the main of mountain alders, mountain ash (*Sorbus sambucifolia*), and Menziesia shrubs. There is sometimes a sparse growth of bear grass, but the sunlight admitted through the dense masses of

trees is usually too scanty to permit the growth of many herbaceous plants. Such tracts represent the young and rapidly growing subalpine forest in the last stage of the reforesting process subsequent to complete destruction by burning. At the present time this type of forest is most prevalent on the slopes and summits of the lateral spurs with northern exposure, and in the saddles, or sags, in the main divides.

The third aspect is that of densely brush-covered areas with a thin forest—10 to 100 trees to the acre—rising from the midst of a sea of brush composed of species of alders (*Alnus alnobetula*), mountain ash (*Sorbus sambucifolia*), and especially of Menziesia and Azalea shrubs (*Menziesia ferruginea* and *Azalea albiflora*, respectively). There is a great amount of litter, consisting of large fallen trees, dry or in a state of decay. Humus is almost lacking, and the young growth, to take the place of the dead old, is scanty. Forest stands which present this phase are either in a state of decay, owing to advanced age, or are produced by forest fires occurring either early or late in summer when the litter was not sufficiently dry to flame, but underwent slow incineration, cooking the bases and roots of the trees. Tracts of this sort occur everywhere in the zone, but are more abundant on the slopes leading into the saddles of the ridges.

The last aspect is confined almost wholly to ridges having an easterly and westerly trend, and, in consequence, presenting their sloping sides directly north and south. The southern face in such situations may contain expanses of 50 to 500 acres having but scattered trees and shrubs, but covered with a dense and heavy growth of many species of mountain grasses. Such tracts are areas that once were heavily timbered, but have had their forest burned off, and, owing to direction and angle of slope causing too rapid drainage and evaporation, have been rendered too arid to permit a renewal of forest growth. The only litter on these tracts are the charred stumps of trees consumed by fire centuries ago. The northern slopes of such ridges usually bear a forest with the aspect of number two, unless, as in some cases, covered with rock slides, while the comb of the ridge has a dense, low-growing belt of young subalpine firs bent and twisted in all directions by the weight of the snow that is blown up over the southern face of the ridge.

The white-pine zone displays fewer aspects. There is usually a large amount of litter, consisting of fallen trees, that have accumulated for centuries, in various stages of decay. The undergrowth is mostly dense, consisting of young trees, the white fir and Merten hemlock predominating. In the low and wet places along the streams various species of shrubs, as alders and dogwood, form dense thickets. There is always a considerable layer of humus, varying in depth from 8 to 14 inches, composed of decaying vegetable débris. The forest is generally wet, often swampy, the humus serving as a sponge and preventing evaporation from the soil beneath. By reason of the considerable size of the trees the aspect of the forest is that of excessive density, but it



YELLOW-PINE GROWTH ABOUT 100 YEARS OLD IN THE LOWER YELLOW-PINE ZONE, PRIEST RIVER FOREST RESERVE.

is rather medium than otherwise, having from 150 to 400 trees 6 inches or more in diameter to the acre on tracts of second and old growth.

To the white pine zone belong the areas supporting a nearly pure growth of lodgepole pine. They are found throughout the reserve on the lower flats and terraces of the stream valleys. In some localities they are of considerable extent, the largest area being just below the south end of Lower Priest Lake and stretching thence nearly to the junction of the East Fork with the main Priest River. This character of forest is usually very dense, the areas containing from 800 to 2,000 or more trees to the acre. There is often a considerable amount of litter, consisting wholly of broken-down young growth. Where the forest has reached an age of 90 years and upwards there has accumulated a depth of humus ranging from 3 to 6 inches. The undergrowth is low and scattered, composed mainly of Pachystima, service berry, Holodiscus, and various species of alders and willows.

The forests of yellow pine present two phases. First, the areas where the preponderance of growth belongs to the yellow pine. This occurs on rocky slopes of low elevation facing the south or west. The forest floor is generally covered with grass or sedges that grow in dry soil. The undergrowth is at minimum density and is formed of low shrubs, such as Holodiscus, Opulaster, wild syringa, mountain ash, and the sanguineous Ceanothus. Humus is lacking or is a mere top dressing of dry pine needles and cones. There is no litter except where a fire has recently swept through.

The second phase of the forest occurs where the red fir replaces the yellow pine. This takes place whenever there exists a deeper, less rocky soil, heavier precipitation, and less rapid drainage.

The grassy slopes characteristic of the former phase of the zone are mostly lacking, and are replaced by a heavier and more extended growth of the shrubs previously enumerated. The forest growth is dense, in some localities ranging from 800 to 1,500 trees to the acre, but where such density exists the diameters of the individual tree are small. The litter is generally abundant, consisting of fallen trees, and the humus attains a depth of 3 to 5 inches.

## AMOUNT OF AVAILABLE TIMBER.

By reference to the table on page 249 it will be seen that the estimated amount of merchantable timber on the reserve is 4,833,600,000 feet B. M. Less than 2,000,000,000 feet are contained in sizes suitable for saw logs. This shows that there is a vast amount of young growth. The large areas covered with this growth are due to the burnings of 120 to 150 years ago, the reforesting process just entering the fourth stage, or second growth. They bear, however, very nearly as great quantity of timber as the areas of old growth, by reason of their excessive density, but the diameters of the standing trees are relatively

small. The availability of the timber depends on two conditions: first, accessibility, as determined by the topographical features of the country; second, the particular line of forestry policy adopted with regard to the amounts that may be safely cut without impairment of the strength of the forest. By strength is here meant the collective resistance offered by the living growth to the wind, which is by far the most destructive natural agent that operates in the basin.

It would require a long and close exploration of the reserve to estimate with accuracy the amount of timber available under the two conditions named, and the table of estimates prepared in this connection should only be taken as indicative of a rough average.

The following estimate of the total amount of standing merchantable timber is given:

| | Feet. |
|---|---|
| Young growth | 3,141,840,000 |
| Second and old growths | 1,691,760,000 |
| Total | 4,833,600,000 |

The amount accessible is estimated as follows:

| | Feet. |
|---|---|
| Young growth | 2,073,614,400 |
| Second and old growths | 1,353,408,000 |
| Total | 3,427,022,400 |

Of this the following amount may be safely cut without impairment of the forest strength:

| | Feet. |
|---|---|
| Young growth | 377,020,800 |
| Old growth | 270,681,600 |
| Second growth | 406,022,400 |
| Total | 1,053,724,800 |

The real area of accessibility is an uncertain factor. It is one that varies constantly with the price of lumber products and of labor, the character of seasons, etc.

Practically there are no areas in the white and yellow pine zones beyond reach. It is simply a matter of profit and loss in providing means of transportation from the steep upper hillsides and narrow canyons to the flats and valleys below. The possible output may also be greatly increased by increasing the cutting in each of the tracts beyond the limit here suggested.

## SOUNDNESS OF THE TIMBER.

The dominant tree in the subalpine zone, *Abies lasiocarpa*, is commonly subject to heart rot at an early period in its growth. It is rare to find trees with diameters of 10 inches and upward that do not show a ring of decay at the core. The white-bark pine, on the contrary, is commonly sound even at the most advanced age. The wood is hard and tough, resisting decay to a remarkable degree, and if the tree grew in accessible localities would be of value in cases where it forms a siz-

able clear trunk, as is sometimes the case. The other trees of the subalpine zone are generally free from defects, except such as are caused by external violence, as breakage by wind and snow. It may be estimated that of the total growth in this zone about 60 per cent of the trees from 6 inches in diameter at the base and upward are defective from some cause. The timber in the white-pine zone contains considerable defective portions. Aside from the damage done by forest fires, which is not taken into account now, there is a great deal of heart rot, wind shakes, and gum cracks. Most of the damage occurs in the white pine, which appears to be more subject to decay here than elsewhere in the West. The percentage of defect varies with character of soil and age of growth. It is greatest on areas of old growth and on low ground, and least in the second growth and on moderately dry soils. The percentage runs from 15 to as high as 25 per cent in the former, and from 5 to 15 per cent in the latter, all species of trees included. More than three-quarters of these amounts belong to the white pine alone. Next in frequency of defect come the cedar, Merten hemlock, and western tamarack, in the order named. The most common defects are attacks by fungi, causing either decay of the heartwood or destruction of the cambium layer in the growing trees, wind shakes, gum cracks, and breakage and splitting of the trees by the excessively violent winds or snows. Aside from the agencies of man and wind, fungi are the most destructive. The white pine and cedar are especially subject to their attacks. The weakening effect of decaying heartwood on such tall trees is to render them less capable of resisting great wind stress, and therefore more liable to development of wind shakes and gum cracks. The defects at the heart of the white pine, cedar, and tamarack do not wholly destroy their usefulness, though very materially lessening the value of the individuals so affected. In shingle making, to which purpose the larger cedars are mostly put, the decay at the core, if not too great, does not matter very much, as the central portions are usually discarded in any case, and in the white pine it is a common practice at the mill to saw around the decayed core. The defects in the tamarack are chiefly gum cracks and wind shakes, due in part to the swaying of the tall trees under wind pressure. They are produced mainly in the lower part of the trunk and are pretty sure to enlarge as time passes.

The defects in the yellow-pine zone are mostly gum cracks and crooked and deformed trees. Owing to the open character of the forest in many places the wind has a free sweep. The damage is confined chiefly to the red fir, aggregating about 5 per cent, against less than 2 per cent in the yellow pine.

## MEANS OF TRANSPORTATION OF LUMBER.

The only method available at the present time to transport lumber out of the reserve is by driving on Priest River to its junction with the Pend Oreille, at which point the Great Northern Railway is reached.

The Lower Priest Lake is navigable for steamers of any draft; the upper, owing to shallowness in the Thorofare, only for boats of light draft. Above the upper lake the river can be utilized for driving for several miles by removing the snags that block it here and there. Not many of the side streams can be used for this purpose without expensive improvements in their beds. Some, notably those that enter from the east, are full of big bowlders and interrupted by series of falls, while those from the west either have a sluggish current which meanders through marshy expanses or are much obstructed by windfalls and in some cases by rocky ledges. The valleys on the west half of the reserve, however, with their easy slopes, offer good opportunities for the construction of logging roads to bring their timber to the main river. The water in the river usually maintains until the 1st of August a sufficient depth to permit driving, but by building a dam across the point where it leaves the lake, an undertaking easily accomplished, a sufficient volume of water could be held back in the lake to float logs down Priest River at any time. The area in the southeast corner of the reserve fronting on Pend Oreille Valley is adjacent to the Great Northern Railway, and the timbered valleys are easy of access from that side by means of logging roads. The most feasible way to utilize the water in the tributary streams for logging purposes would be to construct flumes and turn the streams into them.

## LOCAL DEMAND FOR LUMBER.

There is scarcely any local demand. Small quantities of timber are used locally for fencing, building material, shingles, logs, etc., but the total consumption for these purposes is insignificant. There are no sawmills in the reserve. The nearest point at which a sawmill is located is Sand Point, at the northwest corner of Lake Pend Oreille. If the lumber on the reserve could be obtained without trespass and its attendant difficulties, it is pretty certain that sawmills would soon be established near the outlet of Priest River, in the Pend Oreille Valley, for the manufacture of lumber and shingles. The quantity of tie timber on the reserve is immense, and railroad ties are nearly always in demand at good prices to the producer.

## TIMBER CUTTING.

The cutting done in the past on the area now included in the reserve was chiefly in connection with the construction of the Great Northern Railway some years ago. The timber taken was almost wholly tie timber and piling, consisting of young trees 12 to 20 inches in diameter, of cedar, hemlock, spruce, and tamarack. Most of the cutting was adjacent to the line of the road where it passes through the southeast corner of the reserve. Along a distance of about 6 miles the tie timber on the north side of the road was cut nearly 90 per cent on lands within one-half a mile, and from 35 to 50 per cent on lands a mile, from the line

of road. Since the road was completed small quantities of ties have been cut on lands adjacent to the main Priest River from the outlet into the Pend Oreille to a point about 12 miles above. The cutting done at the present time consists of clearings, wood for fuel, building, and fencing. During the last summer (1898) parties were cutting the white pine on Lower West Fork and floating it to the Great Northern Railway crossing of Priest River, whence it was shipped. Ostensibly the cutting was done with a view of furnishing samples of western white pine to lumbermen in the East. The trees were felled on the Lower West Fork and along the main Priest River, squared in the forest, and floated down the river to a boom at Priest River Station.

## PRESENT CONDITION OF THE FOREST—FIRES.

In the foregoing pages the forest conditions have been detailed with reference to the state of the growing, more or less commercially valuable timber. It now remains to examine the extent of the actual area covered with a forest of this character. The area capable of growing a forest, and that did grow one not very many years back, is about 90 per cent, or 600,000 acres. Of this amount about 60,000 acres belong to the subalpine zone, leaving 540,000 acres as the area capable of producing merchantable timber. The density of the present forest varies considerably. On small tracts in the white-pine zone it may run as high as 120,000 feet per acre, including all timber above 8 inches diameter at the butt, and it may dwindle to 2,000 feet or less, as in some localities in the yellow-pine districts. Had there been no fires in this reserve, 30,000 feet per acre might be safely assumed as a fair average, including all kinds of merchantable timber above 8 inches basal diameter. Given an area of 540,000 acres, we should have a total of 16,200 million feet. But the entire amount on the reserve should be greater. In the lower portion of the subalpine zone there are many tracts containing appreciable quantities of white pine, tamarack, cedar, and red fir. There are probably 10,000 acres of this that would yield an average of 3,000 feet per acre, adding 30,000,000 feet to the figures above. We should have then as a total 16,230 million feet as the amount of standing timber on the reserve. These figures are confidently believed to be under rather than above the true value. Large areas where the forest is untouched have an extremely dense growth, and the long slopes of the ridges and spurs increase the actual acreage considerably over the horizontal measurements, which are the only ones considered here. By reference to the tables of standing timber on the reserve, it will be seen that the estimated amounts standing at the present time are as follows:

| | Feet. |
|---|---|
| Saw timber | 1,903,600,000 |
| Ties, at 20 feet per tie | 2,720,000,000 |
| Telegraph poles, at 100 feet per pole | 210,000,000 |
| Total | 4,833,600,000 |

This leaves a total of 11,396 million feet unaccounted for. This immense quantity of timber, of which the total cutting for all purposes, clearings, etc., does not exceed 20,000,000 feet, and is doubtless much below this figure, has been burned during the last thirty years—burned and wasted to absolutely no purpose. The estimates made on this point while examining the forest were as follows:

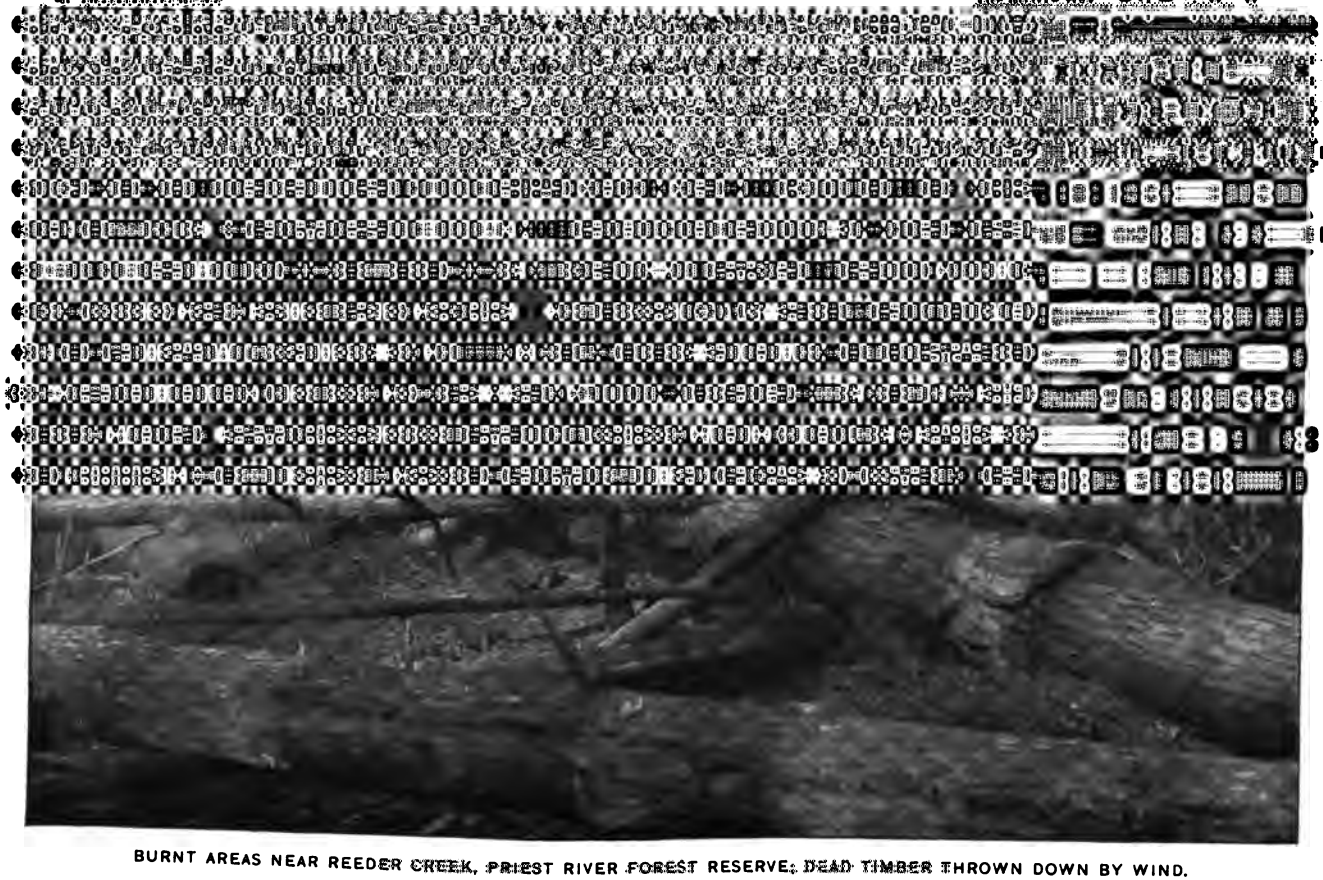
| | Feet. |
|---|---|
| Saw timber | 4,488,800,000 |
| Tie timber, at 20 feet per tie | 4,900,000,000 |
| Telegraph poles, at 100 feet per pole | 600,000,000 |
| | 9,988,800,000 |
| Add for clearings, cuttings, etc | 20,000,000 |
| | 10,008,800,000 |

This leaves 1,387 million feet unaccounted for. We will assume, what is doubtless true, that the burnt areas were not necessarily as heavily timbered in all their parts as are the growing ones now. We can not, of course, be certain on this point. Our estimates must be based on the character of the forest that adjoins the burnt tracts, and on the number and size of the partially consumed stumps and other wreckage.

To keep our estimates low we will therefore ignore the balance of 1,387,600,000 feet, although this amount could, with safety, enter into the estimate as representing other species than those furnishing merchantable timber. The amount could even be increased. Thousands of acres of the subalpine forest have been totally destroyed, leaving not a tree of the original growth alive. It is true that the trees which form the bulk of its growth have no market value at the sawmill, but for local use, such as mining timbers in small workings situated in the high elevations, where no other species are obtainable, the subalpine fir and white-bark pine are vastly superior to the lodgepole pine, often used elsewhere for this purpose. We should not exaggerate if there were added another billion feet to our fire losses from that source.

This timber has not all been literally consumed by fire. The forest fires in this region seldom burn the timber completely. They kill more by cooking the roots and the lower portions of the trunks than they consume. The severe wind storms of the fall and winter throw down great quantities of both dead and living trees, soon completely denuding the burnt-over area. Of the 540,000 acres below the subalpine zone, 280,000 acres average now less than 12,000 feet per acre of all sizes, an insignificant amount for a region with normally so dense a forest growth as the Priest River Basin, while 260,000 acres have less than 7,300 feet per acre.

These averages, however, do not show the real state of the matter. Of the 540,000 acres that make up the white-pine and yellow-pine zones, there are not 80,000 acres that are not seared by fire. Excepting a small area of about 1,600 acres along the Lower West Fork, there is no body of timber of 1,000 acres, or even 500 acres, extent not scorched



BURNT AREAS NEAR REEDER CREEK, PRIEST RIVER FOREST RESERVE; DEAD TIMBER THROWN DOWN BY WIND.

by fire. In the two lower zones there are over 200,000 acres on which the destruction is practically complete. In the subalpine zone at least 40,000 acres of the 60,000 have been more or less injured by fires.

One meets with burnt areas everywhere—in the old growth, in the second growth, in the young growth, and where the seedlings that are beginning to cover the deforested areas have just commenced to obtain a fair hold. The burnt tracts are in large blocks, thousands of acres in extent, and in small patches of 15 to 50 acres which extend in all directions through the forest, which at a distance is apparently green; sometimes they are in broad swaths, sometimes in narrow, tortuous windings just sufficient to open a lane for the destructive high winds to tear the living forest down. The burnt areas are scattered all over the reserve, but the largest amount of damage lies within the zone of the white pine, by reason of its greater extent and peculiar susceptibility to destructive fires. The most extensive plats of burnt forest are found in the northern and western portions of the reserve, corresponding exactly to the regions that are supposed to contain the largest areas of mineral-bearing country.

Forest fires occurred in the Priest River Basin ages ago. About one hundred and fifty years ago the area surrounding the lower and, in part, the upper lake was burned over to the extent of more than 60 per cent. Later, a large tract south of the lower lake shared the same fate. This is proved by the great quantities of young growth, less than 100 years old, that exist in many places with very old trees in their midst. After these fires came an interval of sixty to seventy years with but few burns, involving only small areas. The beginning of the fires of modern times in the basin dates back about thirty years. They owe their origin mainly to the universally wanton disregard for the value of the growing forest in general, and for public property of this kind in particular, which is so unfortunately prevalent in the West. Many of the fires have originated within the present boundaries of the reserve. Those of late years have all started there. Others have come in by way of the Pend Oreille Valley, from the Metaline mining districts, and from other real or supposedly mineral districts. Still others have originated east of the Pend Oreille divide near Lake Pend Oreille, and between it and the Kootenai River, thence spreading westward into the basin. The areas adjoining the reserve are indeed more devastated by fires than those contained within it. Prospectors, hunters, and trappers have kindled most of the fires, and still continue to do this. Large areas in the main Priest River Valley, in the dense old and second growths, have been burned by the various supervisors in charge of the wagon road from Priest River Station to the south end of Lower Priest Lake. They set fire to the heaped-up brush along the side of the road, and the fire spreads thence into the adjoining timber without check or hindrance. This is done as an expeditious and inexpensive way of improving a wagon road.

The pecuniary loss to the Government, and to the community in whose neighborhood the burnt areas are situated, is immense. The marvelous apathy of public sentiment at the destruction of such important sources of wealth as the Western forests can only be accounted for on the supposition that the enormous interests involved and the vast losses that the forest fires cause are never realized. It is true that the forest growth in the Priest River Basin has been exceptionally heavy, and that therefore the losses elsewhere, on areas of like extent, have not been so great, but they are nevertheless of sufficient magnitude in any locality to demand a speedy and decided change in public sentiment.

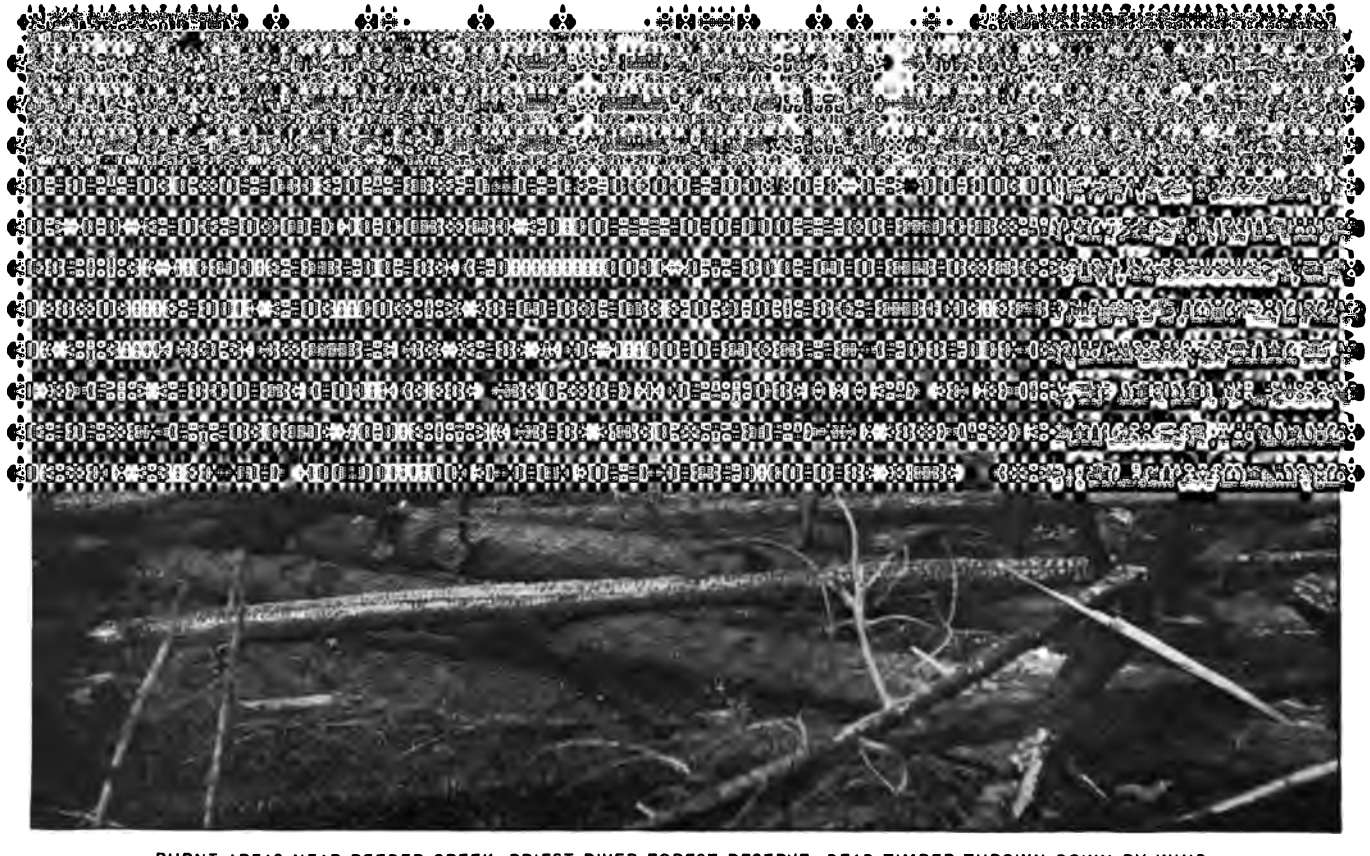
Our estimates place the fire loss in forest material throughout the Priest River Basin for the last thirty years at 4,488 million feet of saw logs, 245,000,000 railroad cross-ties, and 6,000,000 telegraph poles. These have a monetary value in the forest about as follows:

| | |
|---|---|
| 4,488,800,000 feet of logs, at 50 cents per thousand feet | $2,244,400 |
| 245,000,000 ties, at 2 cents per tie | 4,900,000 |
| 6,000,000 telegraph poles, at 5 cents per pole | 300,000 |
| Value of young growth during thirty years | 1,500,000 |
| | 8,944,400 |
| Less depreciation by windfalls, etc | 447,220 |
| Net loss | 8,497,180 |

These figures are based on the low and customary stumpage that obtains now. The stumpage loss, however, is in fact but a small percentage of the real loss. The community that has in its midst, or adjacent to it, a large area of mature forest in a state of good preservation has a mine of wealth, if not at once in the not far-distant future. The working and business interests of such a community are the chief losers in the destruction of the neighboring forest. It has in the past been customary to compute the loss from forest fires on the basis of stumpage, but any account that does not include the losses to the working and business interests of the community most nearly interested fails to gage the matter properly.

To bring the products of the forest to the hands of the consumer requires a large amount of labor of various sorts. Large sums of money are brought in and set loose in different business channels. Taking this into account, let the computation be based on the value of the product when ready for consumption at the mill or railroad track.

| | |
|---|---|
| 4,488,800,000 feet lumber, at $10 per thousand | $44,888,000 |
| 245,000,000 railroad ties, at 20 cents per tie | 49,000,000 |
| 6,000,000 telegraph poles, at 25 cents per pole | 1,500,000 |
| Value of young growth during thirty years | 15,000,000 |
| | 110,388,000 |
| Less depreciation during thirty years | 4,447,220 |
| Net loss | 105,940,780 |



BURNT AREAS NEAR REEDER CREEK, PRIEST RIVER FOREST RESERVE; DEAD TIMBER THROWN DOWN BY WIND.

This amount could readily be further increased. There is the added loss to the sections obliged to import lumber from long distances, owing to the supply near home having been burned up. Then the value of the young growth is placed low—less than 90 cents per acre per year—and no account is taken of the utter destruction of the humus of the forest floor which usually ensues. The humus is absolutely necessary to a first-class growth of such species as the western white pine, the tamarack, the cedar, and the hemlocks; and one of the most serious results of forest fires is the destruction of this vegetable layer. On areas where the burning of it has been complete, it may require fully one hundred years before a sufficient depth has accumulated to make possible the growth of the species enumerated. It rarely requires less than twenty years, unless the situation is exceptionally favorable as regards moisture.

When it is considered that forest fires can easily be kept in check, the destruction they bring seems all the more deplorable. All that is required is an active, healthy public demand, in the localities, counties, or States where they occur, that they must cease, and a proper enforcement of the laws bearing on the subject. But so long as people living in the forested districts believe in and applaud the sentiments frequently heard uttered on the reserve, so long fires will rage, unless stopped by Government interference. It has been a common occurrence to hear such remarks as, "If the Government intends to guard and preserve the timber from fires and prevent unlimited cutting, we will try to burn up what is left as soon as possible;" or, "Since the reserve has been set aside every prospector carries an extra box of matches along to start forest fires with." These sayings were not made in a spirit of bravado, but with the conviction that the course outlined was the proper one to pursue to show their disapproval of Government interference in what they have heretofore considered their rights, namely, to cut, slash, or burn, as convenience or fancy might dictate. Such sentiments are common almost everywhere in the forested region in the West among those classes whose occupations bring them into closest touch with the living forest. The other classes care but little one way or another. It is deplorable that such should be the case.

## EFFECT OF FIRES ON REPRODUCTION.

The after effects of fires depend on the season of the year in which they occur, the supply of moisture to the portion, slope, or terrace burned over, and, last and most important in the white-pine region, the more or less complete incineration of the humus, as this layer of mold is indispensable to the growth of a commercially valuable white-pine forest. By humus is here meant the topmost layer of the forest floor, composed of decaying pine needles, wood, and vegetable débris of all sorts. It is always in an active stage of decay, accelerated by its ability to retain moisture and by the vast number of fungi that send

their mycelia through it in all directions. It is not a fertile bed for grasses or small herbaceous plants, but for certain forest trees it is indispensable. None of the conifers that normally belong to the white-pine zone possess a taproot. They penetrate into the layer of soil but a few feet, sending out their roots widely just under the humus. Forest fires and their after effects vary more or less in different regions. The account here given of the fires within the Priest River Reserve are therefore not to be considered as furnishing a standard applicable to other sections.

Forest fires prevail at three seasons of the year: Spring, from late April to June; summer, from the middle of July to the beginning of September; and fall, from the beginning of September to the middle of October. Conflagrations during the first two seasons are more common; during the latter they are comparatively rare and are mostly survivals of the summer fires not quenched by the fall rains. The spring fires burn slowly and flame but little; the humus incinerates slowly, and many patches are thoroughly drenched with contained moisture and do not burn; the subalpine areas are covered with snow, or at least are extremely wet, and fires can not readily spread beyond the lower zones, therefore not across ridges high enough to touch the upper zones. The summer fires find the humus, if not thoroughly dry, yet sufficiently dry to permit rapid incineration, and conifers are ready to shed their leaves, which now contain little moisture but sufficient terebinthine matter to flame furiously, communicating the fire to whatever dead branches exist in the trees. The summer fires therefore flame considerably, and when fanned by a strong wind, which frequently happens in this basin, open to the south, burn furiously. Fires at this season are most destructive, and encounter no particular check to their progress. The fall fires resemble those that occur in the spring, but are even less extensive.

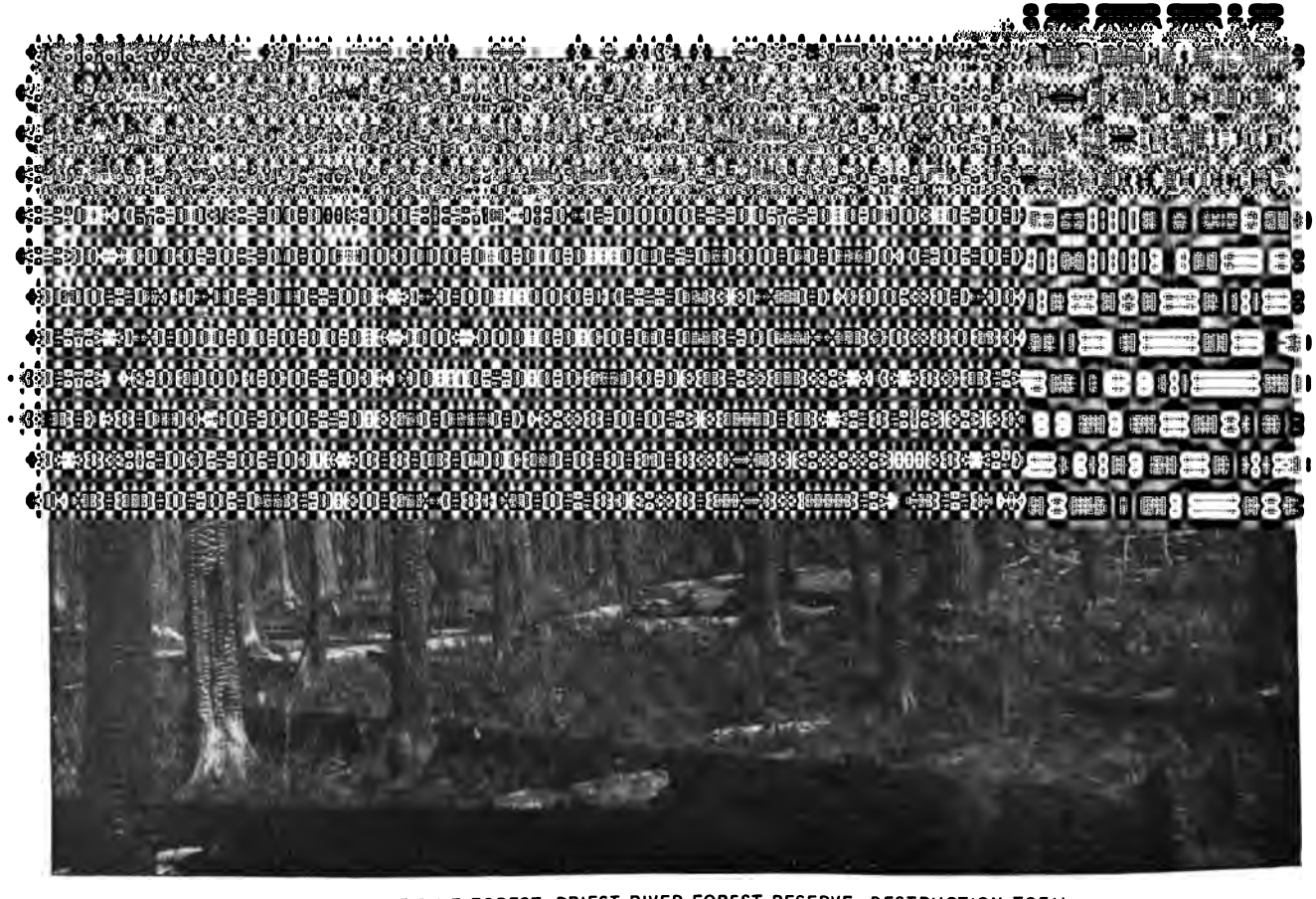
Fires in the subalpine zone occur in the summer. If very early they resemble the spring fires in the zones below. Occurring on the high ridges, the wind has a better chance to accelerate their spread and create a hotter fire, which burns the humus completely.

Reforestation in this zone proceeds more or less rapidly according to the intensity of the fire and the slope exposure. In general it is extremely slow, but usually the same species that occupied the ground originally come in again as the predominant forest growth. Sometimes in the lower edge of the zone a preponderance of the lodgepole pine forms the growth, but usually it is either the subalpine fir or white-bark pine, or both, that come in on the burnt tracts. On areas where the fires ran in the early summer or fall, or on humid northern slopes, where they occurred during the summer and did not wholly destroy the humus, although cooking, killing, and partially burning the forest, there come in, as the first attempt at reforesting, dense masses of Menziesia shrubs with a liberal admixture of alders and mountain ash. These shrubs exist everywhere throughout the subalpine zone in certain proportions at all times. Their roots extend far below the humus into

FIRE STARTED BY ROAD SUPERVISOR IN JULY, 1897, IN THE WHITE-PINE TIMBER 1 MILE BELOW THE JUNCTION OF THE EAST FORK AND PRIEST RIVER.

trees that at first appears are almost invariably others than the white pine. The factor that determines the length of time that must intervene between a burning and a reforesting with the original species is moisture supply. A burnt-over valley terrace exhibits best the different aspects of the process. Let us suppose that it is a case where the dead trees have been thrown down by wind and the débris cleaned up by a second fire. The first effect is sterility, brought on in part by excessive evaporation, producing aridity, and doubtless in part by chemical changes in the top layer of the soil, for it is a notable fact that the iron in the soil, previously existing as sulphurets, is desulphurized and oxidized, coloring the soil shades of red and brown. On this sterile surface mosses begin to grow, *Polytrichum juniperinum*, *Funaria hygrometrica* and *Leptobryum pyriformum* being the most common. Gradually herbaceous plants come in and a top layer of mold is formed, representing the first stage. The second commences when shrubs begin to obtain a foothold. In dry situations, like the valley terraces in the Priest River Basin, the principal shrubs are *Ceanothus velutinus*, *C. sanguineus*, *Salix flavescens*, strictly a bush, *Populus tremuloides*, and *Amelanchier alnifolia*, also shrubby. These species add to the top layer of mold one in which decaying leaves constitute the principal part, not deep but sufficiently retentive of moisture to serve as a seed bed for the conifer that comes in at the third stage, the lodgepole pine. It comes in with extreme density, soon driving out nearly all other vegetation, herbaceous and shrubby. It may persist in that aspect for twenty-five to thirty-five years, but is gradually thinned out by natural processes and the forest floor begins to be covered with a sward of sedge, usually *Carex geyeri*, and a thin growth of shrubs, such as *Pachystima myrsinites*, *Vaccinium cæspitosum*, *Holodiscus discolor*, and *Opulaster malvaceus*. This is the humus-forming period, which may persist for more than a hundred years. As the humus accumulates the fourth stage of reforesting begins with species of the original forest again occupying the area, but the restoration of the ancient balance between the species is a very slow process. The fifth process is simply the growth of the young trees as they progress toward the second and old growths.

When the white pine is burned on a tract of low-lying land supplied with plenty of moisture, and the trees are thrown down, they often remain as they fall until they decay. The logs do not always dry out sufficiently to burn the second time, or they burn but partially. If the humus is burned entirely out to the underlying soil, shrubs, willows, alders, and the like are the first to put in an appearance. As the fallen logs decay a humus is formed that serves as a germinating bed for seeds of the Merten hemlock and the cedar, which come in in immense numbers and soon cover the ground with a compact mass of seedlings. The Merten hemlock, obtaining a hold on the soil in such localities, often persists for ages to the almost complete exclusion of the white pine and tamarack. Where the humus is not completely wiped out,



BURNT WHITE-PINE FOREST, PRIEST RIVER FOREST RESERVE; DESTRUCTION TOTAL

the white pine, tamarack, and white fir usually come in from the first, mixed to some extent with alders and willows.

The yellow-pine zone has little humus—often none at all. Fires in these areas burn rapidly, and always with a flame. The grass that covers the forest floor is the chief agency in spreading the conflagrations. The fires occur in spring, summer, and early autumn, especially in late summer when the grass is dry. The destruction is greater where the red fir prevails than where the yellow pine is the principal species. The yellow pine resists the fire better than any other forest tree in this region, while the red fir is readily killed. The after effects of the fires here also depend on the moisture supply. Both the yellow pine and the red fir will germinate without the humus layer, provided there is sufficient seepage under the soil. Seeds of the yellow pine will germinate if there be but a moderately grassy forest floor for their reception. Where the yellow pine grows the forest is open and the ground supports a grassy growth. The fire runs rapidly, but does not kill out the grass, which comes up again in the fall of the same year or the following spring. The fires, however, destroy the year's seedling plants, thus preventing reproduction, and weaken the old trees by development of gum cracks and barkless pitch streaks that furnish an entrance for subsequent fires to the center of the tree. Where red fir prevails in the zone there is a heavier growth of timber and brush, with some humus. The fires often sweep such areas entirely clean of living timber. If there is no seepage near the surface the soil is rendered arid, as in the white-pine terraces, and goes through nearly the same course of reforesting, except that in place of the lodgepole pine white fir often comes in. Where there is an abundance of seepage, as on the humid slopes of the spurs, the red fir may come in as the first tree in the reforesting process after a short course of willow and Ceanothus growth.

It may be well to summarize briefly the conclusions reached. The effect of fires in the subalpine zone is to cause permanent deforested tracts on the southern slopes above water level;[1] below this, when exposure of slope is toward the west, north, or east, brush-covered ridges for an indefinite period, reforesting slowly, but with preponderance from the first of the species that composed the original growth.

The after effects of fires in the white-pine zone are decided sterility of the soil on valley terraces, coupled with aridity due to excessive evaporation; in low places, and on north, east, and west slopes, densely brush-covered tracts. Reforesting proceeds slowly on lands of the former character, but more rapidly on the latter, provided the humus is not wholly destroyed. Lodgepole pine is usually the first tree in the reforesting process on the bench lands; cedar, Merten hemlock, and Engelmann spruce on the lowlands and on humid slopes; on south slopes,

[1] Water level is the line on any given slope where the seepage from the crest above first comes to the surface. It varies with changes in angle of slope, dip, and strike of the strata, fissuring of the rock formation, etc.

lodgepole pine and red fir. The approximate time required to reestablish the white-pine forest through natural processes is from eighty to one hundred and fifty years on bench lands; twenty to eighty years on lowlands and north, east, and west slopes of mountains; and apparently centuries, in some cases, on south slopes. Approximately sixty to one hundred and twenty years is required after reestablishment of the forest before it will supply merchantable timber. The total time required, under the most favorable circumstances, for the white-pine forest to furnish merchantable timber after destruction by fire is one hundred and sixty to two hundred and seventy years on bench lands and terraces, eighty to two hundred years on lowlands and humid slopes of the elevations, and several centuries on the dry southern slopes.

The results from fire in the yellow-pine zone are: Where the yellow pine predominates, entire cessation of reproduction by the repeated burning of the seedlings and very young trees, slow but certain destruction of the large growing timber, and enlargement of the grass tracts, which eventually become covered with brush growth; where the red fir is the prevailing tree, excessively dense development of brush on the burnt-over land. Reforesting in the yellow-pine districts begins as soon as fires cease, with yellow pine, red fir, and lodgepole pine; and in the red fir districts, with red fir and white fir on the drier tracts and lodgepole pine on the more humid. The brush period lasts from fifteen to fifty years before the original type of forest is reestablished, but where lodgepole pine growth has become firmly fixed the time is indefinite.

## AGRICULTURAL LAND.

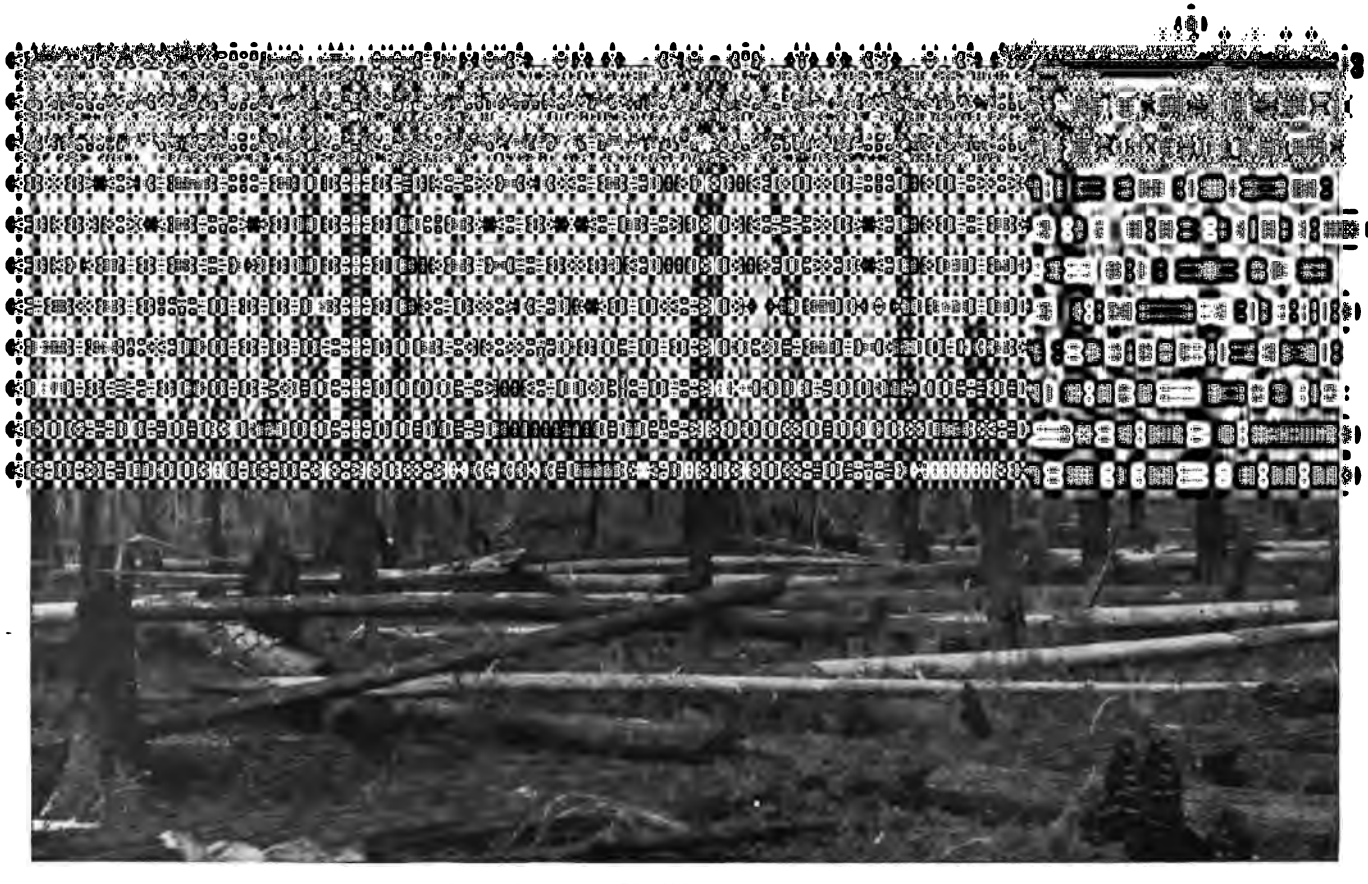
The Priest River Reserve is a forest region. Its natural peculiarities are such that it can never become an agricultural section, and all efforts to make it such should be discontinued. Its chief value lies in the immense forest growth it is capable of maintaining, and in whatever mineral deposits time may disclose.

The agricultural lands amount to about 9,990 acres, distributed as follows:

| | Acres. |
|---|---|
| East half of reserve | 1,850 |
| West half of reserve | 6,940 |
| Pend Oreille Valley | 1,200 |
| Total | 9,990 |

Situated, as to localities, as stated in table on pages 251–252.

These lands consist of tracts covered with coarse sedges or grass; sphagnous bogs capable of being reclaimed; alder and willow swamps too wet for forest growth; and, in the valley of Pend Oreille River, of grass lands subject to overflow, and of cleared lands on the benches adjacent to the streams. The agricultural lands within the reserve are



DESTRUCTION OF A MIXED FOREST, PRIEST RIVER FOREST RESERVE.

found adjoining the streams. They are nearly always wet and swampy, but may be reclaimed by ditching. The bulk of these lands is situated in the western half of the reserve, where the rock formation is softer and in consequence the valleys are broader and more level. Some tracts are clear of brush; others require removal of the mass of willows and alders that covers them. The clearing of the latter class is not difficult and only moderately expensive.

All of the partially clear or grassy tracts are held by settlers, as are some of the alder and willow swamps. The natural meadows are utilized for hay production, the sedges and grass furnishing a sort of coarse hay. In a few cases small patches of the boggy meadow land have been ditched. In such cases crops of oats, potatoes, and common garden vegetables have been raised. Along the Lower West Fork a few acres of the natural meadows have been seeded to timothy. Nearly all these lands are subject to frost at any time during the growing season. Crops of potatoes or garden vegetables are therefore never certain. There is no market for farm products within the reserve Were such articles produced in greater quantities than the home demand required they could not be shipped. There is no cheap transportation available to the railway, and if there were the producer would come into competition with like articles from other sections where they can be grown much cheaper.

The agricultural lands are separated by blocks of green or burnt forests. If any attempt at segregation is made, they will have to be separated—each small parcel by itself—in order to avoid cutting out the intervening areas of timber from the reserve.

The lands in the Pend Oreille Valley are situated in the southeast corner of the reserve. Some consist of low flats near the river and are periodically inundated, others are clearings made in the yellow-pine timber on the bench lands. These lands are far more valuable for agriculture than those in the Priest River Basin, and being nearly in a body, can readily be segregated.

The actual values of all agricultural improvements in the reserve to date are insignificant. There are many squatter's claims, but only a minimum of cultivation has been done on any of these. There is not a single holding that produces nearly enough for the support of even a small family. Agricultural settlements date back seven years, but the total of all lands in the basin brought under the plow since that time does not exceed 70 acres. Of this, perhaps 30 acres represent brush clearings, 20 acres ditched and drained meadows and bogs, and 15 acres clearings on bench lands burned off by forest fires.

Agricultural improvements on the lands in the Pend Oreille Valley are of a more substantial character. Between 150 and 200 acres are under the plow there. In the heavy timber south of Lower Priest Lake considerable land has been surveyed and subdivided, especially in township 57. There is here scarcely a quarter section, on any even-num-

bered section, carrying a good body of white pine that has not a squatter's claim on it, ostensibly for agricultural purposes; yet it is a positive fact that after seven years of settlement there is not in the basin a total of 5 acres cleared from the living white-pine forest.

Such claims at the present time consist simply of a log cabin of the rudest kind surrounded by a "clearing," which means a more or less completely burnt area involving the destruction of 1,000,000 to 4,000,000 feet of merchantable timber. These burnings were made with the purpose in view of establishing a lawful holding with habitation and improvements. The parties claiming these tracts live on them but a short time during the year, there being absolutely no way to gain a livelihood from the land with its present "improvements."

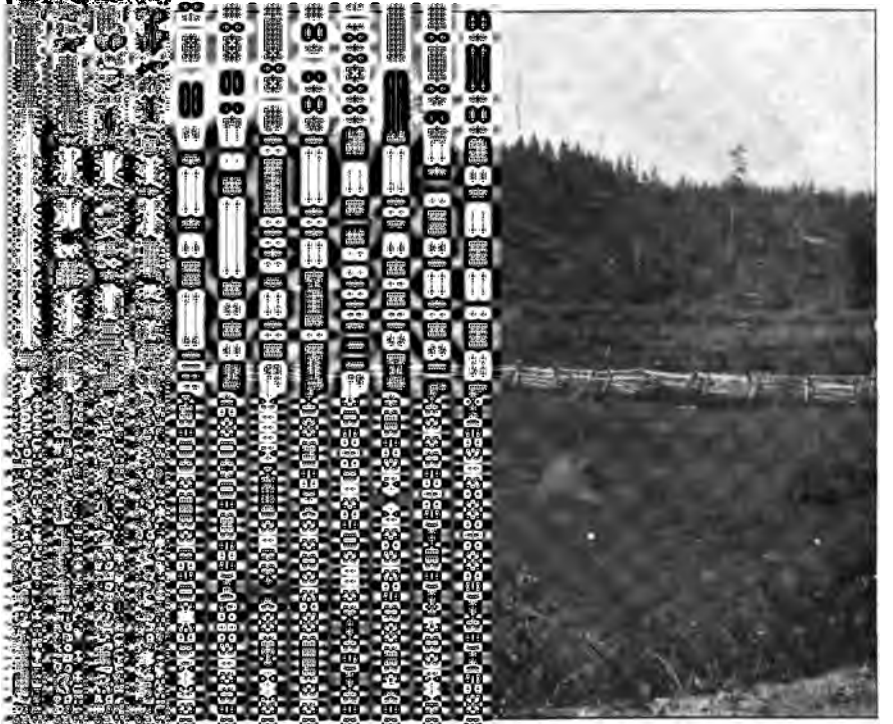
The boggy meadows and brush-covered tracts along the streams have here been considered as agricultural lands. That has been done for the reason that under proper supervision and rules agricultural operations on such lands need not necessarily infringe on the forest. It would be an entirely practical matter, however, to drain these lands at small expense, when they would soon become covered with a dense forest growth. No sheep are pastured in the reserve. Several hundred head of stock belonging to settlers living south of the lower lake range through the white-pine forest, but they do no material damage.

## MINERAL RESOURCES.

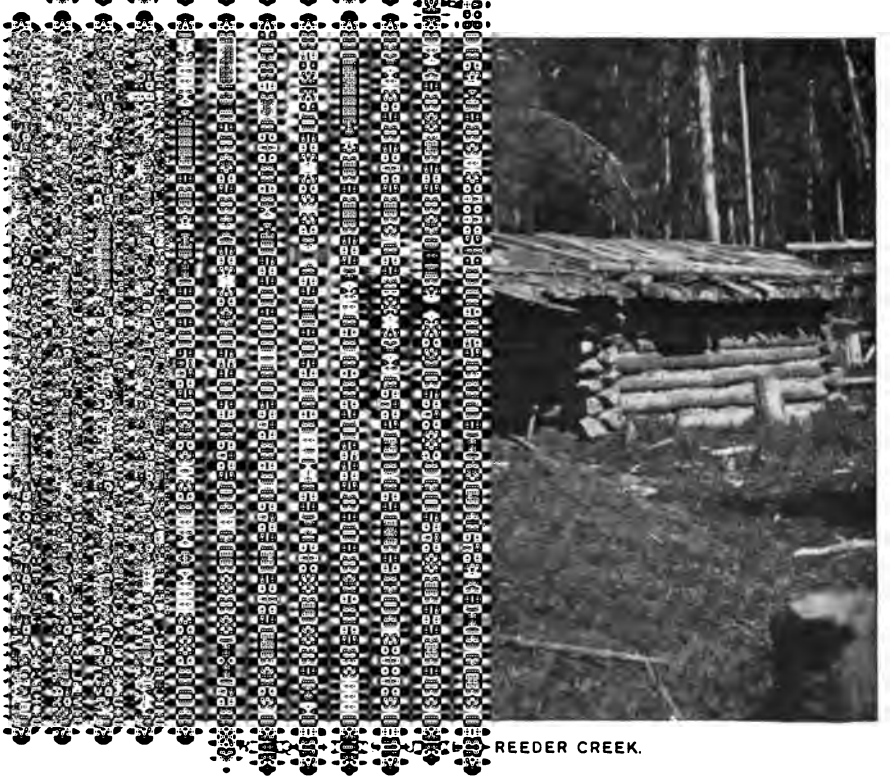
At the present time there are known to exist three mineral-bearing belts, one in the region above the upper lake, one in the central portion, and one midway between the lower lake and the south line of the reserve. Two of these belts have their long diameter easterly and westerly, and very likely stretch entirely across the reserve, while the northern one lies in a northerly and southerly direction. A great many quartz claims have been located in the mineral-bearing zones. There are none sufficiently developed as yet to prove the region a commercially profitable one in the valuable metallic minerals. It is well within the range of possibility that profitable discoveries will eventually be made in this direction.

## CONCLUSIONS.

The Priest River Reserve is admirably situated for sylviculture. It needs no experiments in this direction, but merely immunity from forest fires and encroachments, ostensibly for agricultural purposes, but in reality for purposes of rapine on the merchantable forest. If protected, nature will do the reforesting. It is a demonstrable fact that unless active measures are taken for policing the reserve the present timber will soon share the fate of the other portions of the once magnificent forest. Mere reserve lines will have no effect whatever in



UNCTION OF EAST FORK AND PRIEST



REEDER CREEK.

preventing the destruction so long as public sentiment regarding forest preservation remains indifferent. The forest-fire evil is gigantic and appalling. If not checked, within twenty-five years there will be no accessible forests to furnish lumber products between the Rocky Mountains and the Cascades except such tracts as are under private ownership. Up to the present time the public has not suffered any particular inconvenience from the fires, but signs are rapidly multiplying that a pinch is beginning to be felt in the home timber supply. If the next ten years sees as large a percentage of burnt-over tracts as the last decade, the pinch will become decidedly painful. To combat the evil heroic measures are necessary. A condition confronts us that is not a mere distant shadow, but a stern present reality. To compromise it is to stultify ourselves. It will never cease so long as there is an acre of public forest to burn unless we firmly put an end to the evil and accomplish by coercive measures what an appeal to logic has failed to produce. The Priest River Reserve as a fire-swept region is no worse devastated than many other regions in Idaho and Washington. There are, however, in some other places compensation, small as it is, in the fact that portions of the denuded tracts are utilized for agricultural purposes. In this reserve, on the contrary, for the tens of thousands of acres burned over and the millions of dollars' worth of timber destroyed there is absolutely no gain to show. If it is intended to make a permanent reserve of the Priest River Basin, agricultural settlements should be rigorously confined to the parcels of land now naturally devoid of timber. I do not consider the burnt tracts as coming under this category. The denuded areas are still to all intents and purposes timber lands, requiring only sufficient time for reforesting. It would be better to exclude agricultural operations altogether from the reserve. Failing in this, no claim should be permitted to extend into the forest, even if it became necessary to break up the legal subdivisions into fractional parts. Existing squatters' claims on the timbered lands in the reserve should be ignored as regards any acquired "rights."

To prevent further destruction, the reserve should be policed. There are no tracts of equal extent in this region that can be guarded so easily and with so little expense. The past burnings have nearly surrounded it on three sides with denuded areas, which for years to come will act as natural ramparts. The danger lies from within and from along the south line. To guard it effectually, a patrol of six men from the 1st of April to the 15th of October, during the first year, furnished with at least twelve horses and the necessary equipments, would be required. Two stations should be provided for the patrol, located on the natural meadows of the reserve, so as to furnish the necessary pasturage and hay for the animals. Buildings suitable for quarters should be erected, for which the adjacent forest would furnish the material. There should be one station just above the junction of the East Fork and main Priest River, and the

other on Reeder Creek, about 4 miles west from the lake shore. During the summer the patrol, in conjunction with police duties, should build trails to connect the stations and the different portions of the reserve. The burnt areas, with their huge masses of débris, make traveling without a trail slow, and in many places impossible. Trails should be built as follows: One from the south end of the lower lake along the lake shore to the north end of the reserve, following the valley of the Upper Priest River to its head; one from the point where the present wagon road crosses Blue Creek to the summit of Priest River Range, along this creek or on adjoining slopes; one up the East Fork to the summit of the range; one up Bear Creek, and one up Caribou Creek, both to the summit of the range; and, on the west side, a trail from the south line of the reserve, on the west bank of the river, turning up lower West Fork and following it to its head, thence along the Pend Oreille divide to the north end of the reserve, and turning southeasterly down Gold Creek to its junction with Upper Priest River, thence along the west side of the lake and river to a point opposite the junction of East Fork and Priest River, which should there be crossed. From this trail side trails should be run as necessity may demand.

This system of trails, with the roads already existing, would render all the vulnerable portions of the reserve easy of access and capable of being thoroughly patrolled. After the first construction of these trails, three men with the necessary horses would be sufficient to police efficiently the entire area embraced in the reserve as at present limited.

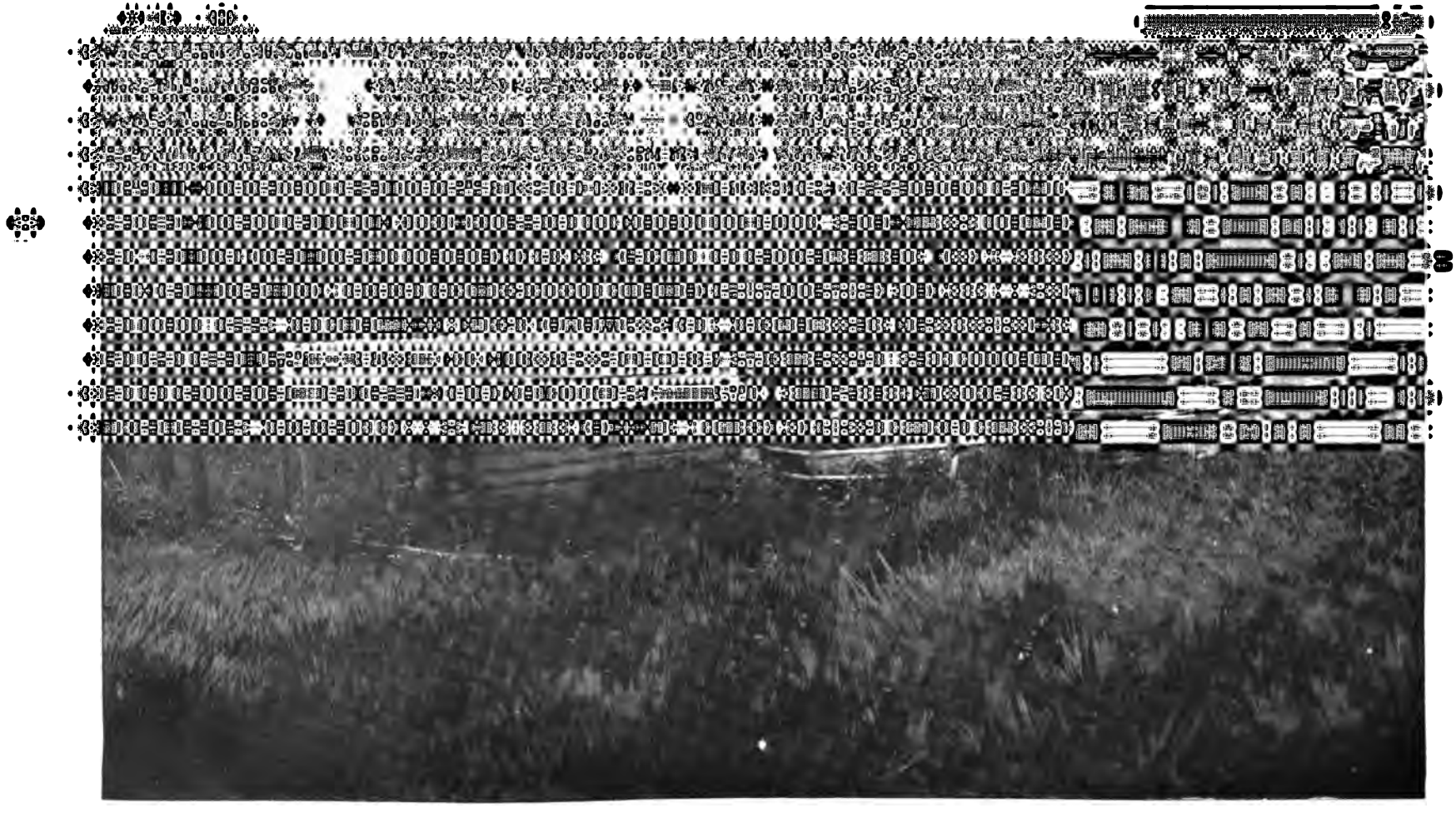
## TABLES.

### LIST OF SPECIES.

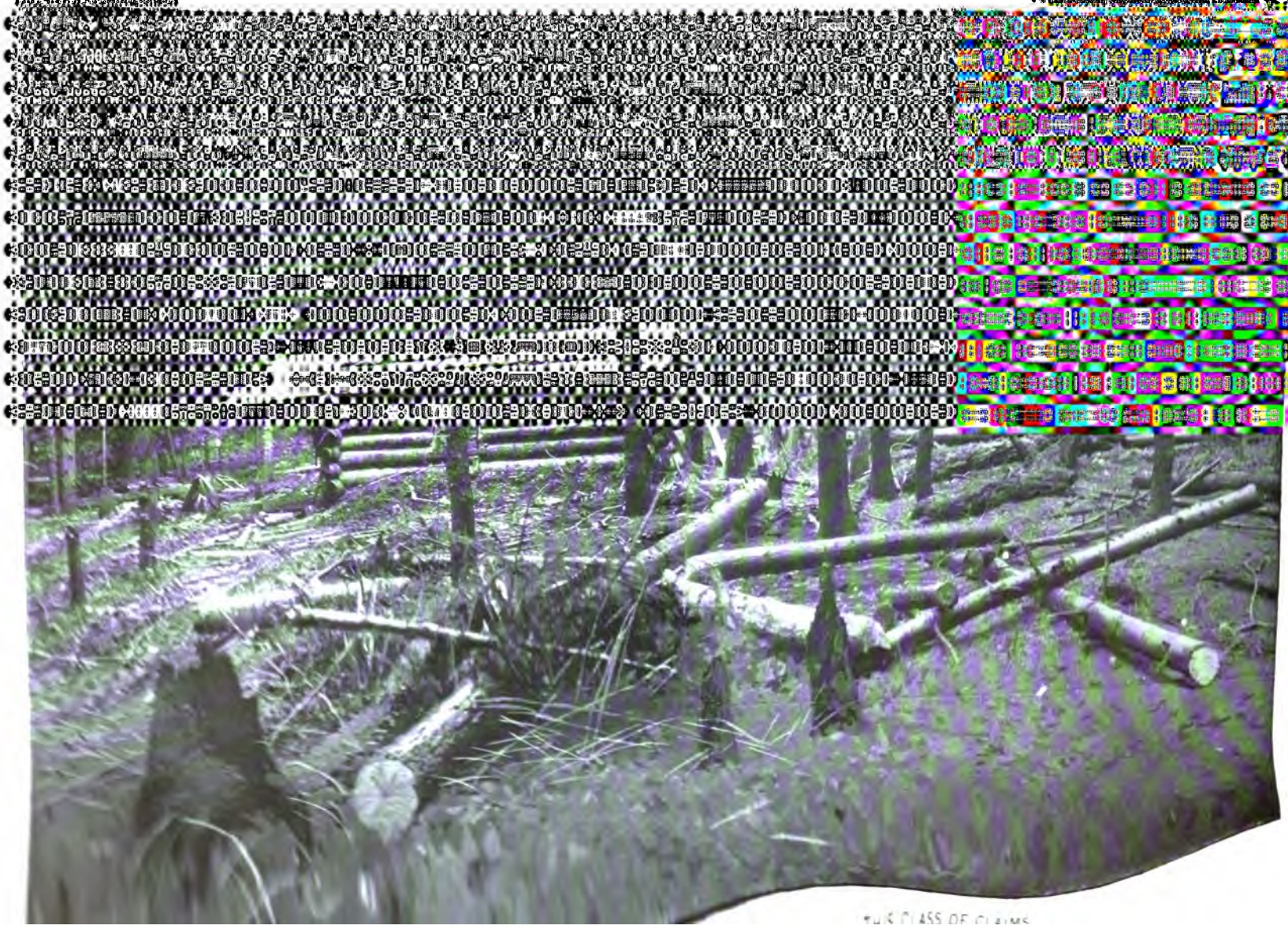
*Species of forest trees.*

I.—ALWAYS ARBORESCENT.

| | |
|---|---|
| Pinus albicaulis | White-bark pine. |
| P. murrayana | Lodgepole pine. |
| P. ponderosa | Yellow pine. |
| P. monticola | Western white pine. |
| Abies grandis | White fir. |
| A. lasiocarpa | Subalpine or balsam fir. |
| Tsuga mertensiana | Merten hemlock. |
| Thuya plicata | Cedar. |
| Pseudotsuga taxifolia | Hemlock-spruce, red fir, etc. |
| Picea engelmanni | Engelmann spruce. |
| Larix occidentalis | Western tamarack. |
| Betula occidentalis | Western birch. |
| B. papyracea | Paper or canoe birch. |
| Populus tremuloides | Aspen. |
| P. balsamifera | Balm of Gilead. |
| P. trichocarpa | Cottonwood. |



SQUATTER'S CLAIM IN WHITE-PINE TIMBER, SHOWING USUAL IMPROVEMENTS ON THIS CLASS OF CLAIMS.



II.—VARYING FROM SHRUBS TO TREES.

| | |
|---|---|
| Amelanchier alnifolia | Service berry. |
| Salix nuttallii | Nuttall willow. |
| S. lasiandra | Willow. |
| Acer glabrum | Maple. |
| Prunus douglasii | Cherry. |
| Juniperus virginiana | Red cedar. |
| Taxus brevifolia | Yew. |

*Species of trees in the Priest River Reserve utilized as lumber trees.*

| | |
|---|---|
| Pinus ponderosa | Yellow pine. |
| P. monticola | Western white pine. |
| Tsuga mertensiana | Merten hemlock. |
| Thuya plicata | Cedar. |
| Pseudotsuga taxifolia | Hemlock-spruce, red fir, etc. |
| Picea engelmanni | Engelmann spruce. |
| Larix occidentalis | Western tamarack. |
| Populus balsamifera | Balsam poplar. |
| P. trichocarpa | Cottonwood. |

## PROPORTION OF SPECIES.

*Proportion of trees composing the forests.*

I.—IN THE ENTIRE FOREST AREA[1].

| | |
|---|---|
| Pinus monticola | 33 |
| Larix occidentalis | 25 |
| Pseudotsuga taxifolia | 15 |
| Abies lasiocarpa | 8 |
| Pinus murrayana | 7 |
| Thuya plicata | 6 |
| Picea engelmanni | 3 |
| Tsuga mertensiana | 2 |
| Pinus ponderosa | (2) |
| P. albicaulis | (2) |
| Abies grandis | (2) |
| Betula papyracea | (2) |
| B. occidentalis | (2) |
| Populus tremuloides | (2) |
| P. trichocarpa | (2) |
| P. balsamifera | (2) |

II.—IN THE SUBALPINE ZONE.

| | |
|---|---|
| Abies lasiocarpa | 70 |
| Pinus albicaulis | 28 |
| Picea engelmanni | 1 |
| Larix occidentalis | (2) |
| Pinus monticola | (2) |
| P. murrayana | (2) |
| Populus tremuloides | (2) |
| Pseudotsuga taxifolia | (2) |

[1] In this table are included only individuals of the species enumerated having diameters near the ground of 4 inches and upward and showing a distinct trunk.

[2] Trifling.

III.—IN THE WHITE-PINE ZONE.

| | |
|---|---|
| Pinus monticola | 42 |
| Larix occidentalis | 35 |
| Thuya plicata | 8 |
| Picea engelmanni | 6 |
| Tsuga mertensiana | 3 |
| Abies grandis | 2 |
| Species of Populus, Betula, etc. | 4 |

IV.—IN THE YELLOW-PINE ZONE.

| | |
|---|---|
| Pinus ponderosa | 10 |
| Pseudotsuga taxifolia | 70 |
| Abies grandis | 15 |
| Species of Populus, Betula, Acer, Salix, and Amelanchier | 5 |

*Proportion of lumber trees of commercial size.*

[By commercial size is understood a measurement of 16 inches and upward at the base.]

| | |
|---|---|
| Pinus monticola | 50 |
| Larix occidentalis | 41 |
| Pseudotsuga taxifolia | 5 |
| Thuya plicata | 2 |
| Pinus ponderosa | 1 |
| Picea engelmanni | (1) |
| Tsuga mertensiana | (1) |
| Populus trichocarpa | (1) |
| P. balsamifera | (1) |

## SIZE AND AGE OF TREES.

*Range in size and age of trees.*

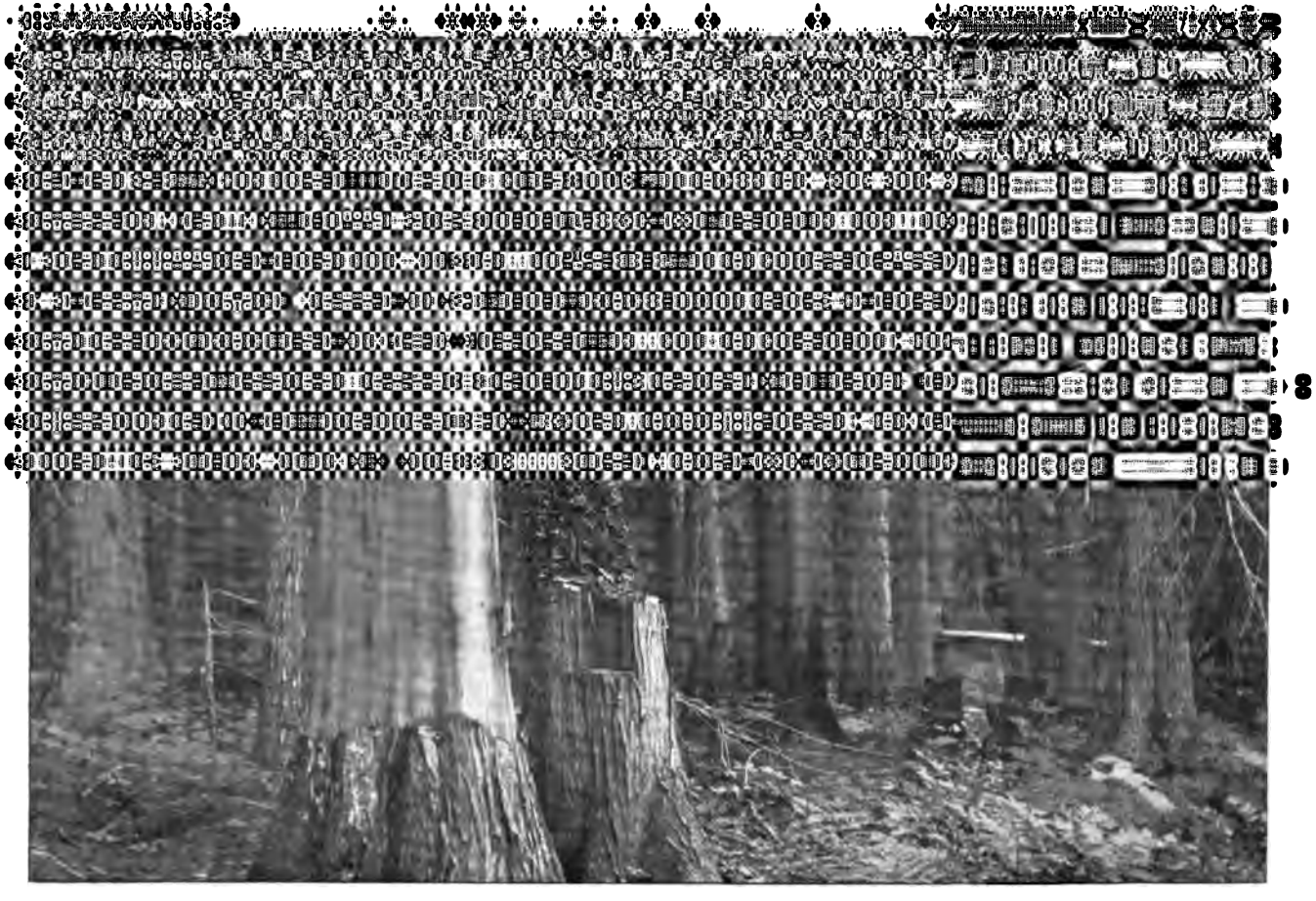
[By clear trunks is meant height to first branches of distinctive crown.]

I.—SUBALPINE ZONE, MATURE FOREST.[2]

| Species. | Height. | Diameter. | Clear trunks. | Age. |
|---|---|---|---|---|
| | *Feet.* | *Feet.* | *Feet.* | *Years.* |
| Abies lasiocarpa | 20 to 60 | 1 to 1½ | 10 to 25 | 40 to 100 |
| Pinus albicaulis | 20 to 50 | 1 to 3 | 0 to 20 | 50 to 200 |
| Picea engelmanni | 40 to 60 | ½ to 1½ | 0 to 30 | 30 to 90 |
| Pinus murrayana | 40 to 60 | 1 to 1½ | 20 to 25 | 100 to 150 |
| Larix occidentalis | 60 to 100 | 1 to 2 | 30 to 50 | 80 to 100 |
| Pinus monticola | 80 to 150 | 1 to 2½ | 30 to 60 | 50 to 120 |
| Pseudotsuga taxifolia | 30 to 100 | 1 to 4 | 0 to 60 | 50 to —— |
| Populus tremuloides | 20 to 25 | ½ to 1½ | 0 | ..... |

[1] Trifling.

[2] The larger heights and diameters are found near the lower limits of the zone; the smaller at altitudes above 5,500 feet.



FOREST NEAR PRIEST LAKE, SHOWING CEDAR TREES BARKED TO FURNISH THATCH FOR HUTS.

*Range in size and age of trees*—Continued.

II.—WHITE-PINE ZONE, OLD TO SECOND GROWTH.

| Species. | Height. | Diameter. | Clear trunks. | Age. |
|---|---|---|---|---|
| | *Feet.* | *Feet.* | *Feet.* | *Years.* |
| Pinus monticola | 150 to 250 | 2 to 5 | 80 to 120 | 200 to 375 |
| Larix occidentalis | 150 to 200 | 2 to 4 | 50 to 120 | 175 to 420 |
| Pinus murrayana | 60 to 100 | ½ to 1½ | 20 to 60 | 30 to 90 |
| Pseudotsuga taxifolia | 80 to 150 | 1½ to 2½ | 50 to 90 | 100 to 200 |
| Thuya plicata | 80 to 120 | *a* 2 to 3½ | 25 to 60 | 120 to 800 |
| Picea engelmanni | 80 to 100 | ½ to 1½ | 0 to 30 | 50 to 120 |
| Tsuga mertensiana | 100 to 120 | *b* 1½ to 3 | 0 to 30 | 100 to 200 to 500 |
| Abies grandis (*c*) | 20 to 70 | ½ to 1 | 0 | 30 to 75 |
| Betula papyracea | 50 to 75 | 1 to 2 | 0 | ..... |
| B. occidentalis | Small. | ..... | ..... | ..... |
| Populus tremuloides | 20 to 40 | ½ to 1 | 10 to 20 | ..... |
| P. trichocarpa | 50 to 100 | 1½ to 3 | 20 to 40 | ..... |

*a* Rarely up to 8 feet. *b* Rarely up to 5 feet.
*c* Rarely 3 feet in diameter, with clear trunks 40 to 80 feet in height.

III.—YELLOW-PINE ZONE, MATURE FOREST.

| | | | | |
|---|---|---|---|---|
| Pinus ponderosa | 50 to 90 | 1½ to 3 | 20 to 40 | 80 to 200 |
| Pseudotsuga taxifola | 50 to 100 | 1½ to 2 | 20 to 60 | 80 to 150 |
| Abies grandis | ..... | Small. | ..... | ..... |
| Pinus murrayana | ..... | Small. | ..... | ..... |

## AREAS OF FOREST ZONES.

*Areas occupied by each forest zone.*

| Zone. | Acres. | Per cent. |
|---|---|---|
| Yellow pine | 60,000 | 10 |
| White pine | 480,000 | 80 |
| Subalpine fir | 60,000 | 10 |
| Total | 600,000 | 100 |

In estimating the areas of the different zones regard is had to the species of forest trees that grew on the various tracts before their deforestation by fires began about thirty years ago, and not to the present conditions of the burnt areas.

## AMOUNT AND VALUE OF TIMBER.

*Estimate of standing merchantable timber.*

SAW TIMBER.

In the absence of surveys the various areas are computed from estimates as to the relative percentages that each bears to the total area embraced in the reserve, which is reckoned at 620,000 acres, exclusive of tracts permanently covered with water.

| Acres. | Average per acre. | Total. |
|---|---|---|
| | *Feet B. M.* | *Feet B. M.* |
| 134,400 | 4,000 | 537,600,000 |
| 60,800 | 8,000 | 486,400,000 |
| 28,800 | 20,000 | 576,000,000 |
| 3,840 | 40,000 | 153,600,000 |
| 150,000 | 1,000 | 150,000,000 |
| 377,840 | ..... ..... | 1,903,600,000 |

In this estimate only trees having a diameter of 16 inches at the base are included, and only such species as are commonly sawed in this region, for enumeration of which see table on p. 245.

Living timber only is included in the above estimates. The amount of standing dead timber can not be computed even approximately. It varies from day to day, depending on the force and direction of the wind, on rain, snow, the degree of rot in the dead trunk and the position of the decay, together with the age of the burn, its location and exposure, the more or less complete burning of the humus, the character of the soil, and many other factors.

RAILROAD TIES.

| Acres. | Average number per acre. | Total. |
|---|---|---|
| 60,800 | 296 | 17,996,800 |
| 134,400 | 755 | 101,472,000 |
| 28,800 | 100 | 2,880,000 |
| 3,800 | 55 | 211,200 |
| 160,000 | 84 | 13,440,000 |
| 387,800 | ..... | 136,000,000 |

This gives, at 20 feet per tie, a total of 2,720,000,000 feet B. M. Trees having diameters at the ground of 8 to 16 inches are considered tie timber. The following species are included in the list:

Pseudotsuga taxifolia.
Larix occidentalis.
Tsuga mertensiana.
Thuya plicata.

*Estimate of standing merchantable timber*—Continued

TELEGRAPH POLES.

| Acres. | Average per acre. | Total. |
|---|---|---|
| 20,000 | 30 | 600,000 |
| 150,000 | 10 | 1,500,000 |
| 170,000 | ..... | 2,100,000 |

This gives, at 100 feet per pole, a total of 210,000,000 feet B. M. The only species utilized for purposes of telegraph poles in this region is *Thuya plicata*, which is not abundantly represented in the forests of the reserve.

RECAPITULATION.

| Kind of timber. | Feet B. M. |
|---|---|
| Saw timber | 1,903,600,000 |
| Railroad ties | 2,720,000,000 |
| Telegraph poles | 210,000,000 |
| Total | 4,833,600,000 |

*Estimated value on root of standing timber.*

| Kind of timber. | Amount. | Average stumpage value. | Total value. |
|---|---|---|---|
| Saw logs.....M. feet.. | 1,903,600 | $0.50 | $951,800 |
| Ties .....number.. | 136,000,000 | .02 | 2,720,000 |
| Poles .....do.... | 2,100,000 | .05 | 105,000 |
| Total ..... | ..... | ..... | 3,776,800 |

*Approximate value of timber when ready for consumption at first point of manufacture.*

| Kind of timber. | Amount. | Average value. | Total value. |
|---|---|---|---|
| Saw logs .....M. feet.. | 1,903,600 | $10.00 | $19,036,000 |
| Ties .....number.. | 136,000,000 | .20 | 27,200,000 |
| Poles .....do.... | 2,100,000 | .25 | 525,000 |
| Total .... | ..... | ..... | 46,761,000 |

Living timber only is included in above estimates. Dead timber there has no commercial value.

## DESTRUCTION BY FIRES.

*Estimate of merchantable timber consumed by forest fires in the last thirty years.*

SAW TIMBER.

| Acres. | Average per acre. | Total destroyed. |
|---|---|---|
| | *Feet B. M.* | *Feet B. M.* |
| 134,400 | 1,000 | 134,400,000 |
| 60,800 | 800 | 48,640,000 |
| 28,800 | 200 | 5,760,000 |
| 3,840 | | |
| 100,000 | 20,000 | 2,000,000,000 |
| 50,000 | 30,000 | 1,500,000,000 |
| 160,000 | 5,000 | 800,000,000 |
| 537,840 | | 4,488,800,000 |

RAILROAD TIES.

| | Number. | Number. |
|---|---|---|
| 50,000 | | |
| 100,000 | 30 | 3,000,000 |
| 120,000 | 100 | 12,000,000 |
| 250,000 | 800 | 200,000,000 |
| 20,000 | 1,500 | 30,000,000 |
| 540,000 | | 245,000,000 |

TELEGRAPH POLES.

| | | |
|---|---|---|
| 200,000 | 30 | 6,000,000 |

*Estimated value of timber burned.*

| | |
|---|---|
| 4,488,800,000 feet, at 50 cents per thousand | $2,244,400 |
| 245,000,000 ties, at 2 cents per tie | 4,900,000 |
| 6,000,000 telegraph poles, at 5 cents per pole | 300,000 |
| Value of young growth during thirty years | 1,500,000 |
| | 8,944,400 |
| Less 5 per cent depreciation caused by windfalls, rot, etc., during thirty years | 447,220 |
| Total | 8,497,180 |

*Approximate value of timber burned at first point of manufacture.*

| | |
|---|---|
| 4,488,800,000 feet saw logs, at $10 per thousand feet | $44,888,000 |
| 245,000,000 ties, at 20 cents per tie | 49,000,000 |
| 6,000,000 telegraph poles, at 25 cents per pole | 1,500,000 |
| Value of young growth during thirty years | 15,000,000 |
| | 110,388,000 |
| Less depreciation in value during thirty years caused by rot, windfalls, etc | 4,447,220 |
| Total | 105,940,780 |

## SUMMARY.

*Estimate of available sound timber.*

| | Feet. |
|---|---|
| Total amount of standing merchantable timber | 4,833,600,000 |
| Young growth less than 110 years old, from 8 to 16 inches in diameter, about 65 per cent, or | 3,141,840,000 |
| Second and old growths over 110 years old and 16 inches in diameter, about 35 per cent, or | 1,691,760,000 |
| Total | 4,833,600,000 |
| Solid young growth, about 40 per cent, or | 1,256,736,000 |
| Young growth mixed with old and second growths, about 60 per cent, or. | 1,885,104,000 |
| Total young growth | 3,141,840,000 |
| Accessible solid young growth, about 60 per cent, or | 754,041,600 |
| Accessible young growth mixed with second and old growths, about 70 per cent, or | 1,319,572,800 |
| Accessible young growth | 2,073,614,400 |
| Accessible old and second growths, about 80 per cent, or | 1,353,408,000 |
| Total accessible timber, about 70.9 per cent, or | 3,427,022,400 |

Amounts that may be safely cut from the accessible places with due regard to the strength of the forest,'

| | Feet. |
|---|---|
| Young growth: | |
| Of solid growth, about 50 per cent, or | 377,020,800 |
| In mixed old and second growths | none. |
| Total young growth | 377,020,800 |
| Old and second growths: | |
| Of old growth, reckoned at 20 per cent, about 80 per cent, or | 270,681,600 |
| Of second growth, reckoned at 80 per cent, about 30 per cent, or. | 406,022,400 |
| Total old and second growths | 676,704,000 |
| Total available merchantable timber | 1,053,724,800 |

Cord wood and fencing material are excluded from above estimates. Fencing material is an uncertain factor and cord wood has no other value in the reserve than the labor expended upon it.

*Agricultural lands.*

| | Acres. |
|---|---|
| Fork of Upper Priest River (Gold Creek) | 300 |
| North end of Upper Priest Lake | 280 |
| North end of Lower Priest Lake | 200 |
| Upper Granite Creek | 500 |
| Reeder Creek | 1,030 |
| Kalispel Creek | 100 |
| Bear Creek | 350 |
| Soldier Creek | 200 |
| Medly Creek | 140 |
| South end of Priest Lake | 250 |
| Junction of East and Priest rivers | 425 |
| Big Creek | 160 |

| | Acres. |
|---|---|
| Lower Priest River above rapids | 300 |
| Long Creek (Blue Creek) | 250 |
| East Pine Creek | 50 |
| Lower West Branch of Priest River, including swampy country between the heads of West Branch, Benars, Lamb, and Granite creeks | 3,380 |
| Pend Oreille Valley | 1,200 |
| Small creeks (no names) | 375 |
| Narrow strips of alder swamps along small creeks, beaver ponds, drainable lakelets, and cranberry bogs | 500 |
| Total | 9,990 |

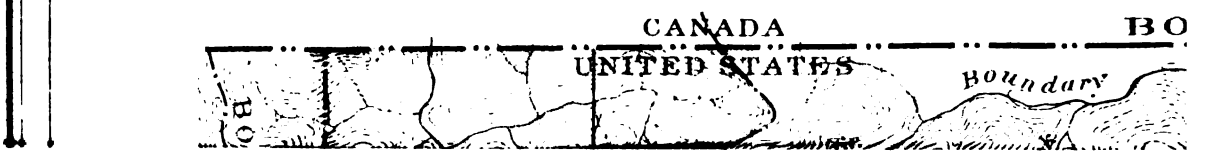
These areas comprise land more valuable for agricultural than for forestry purposes.

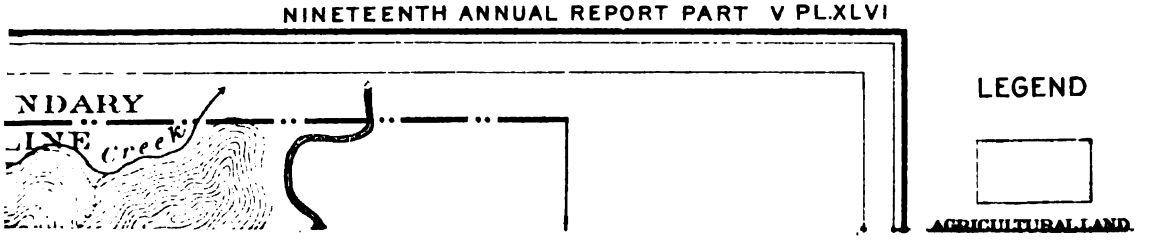
cres.
300
250
50

380
200
375

500
990

or




NDARY
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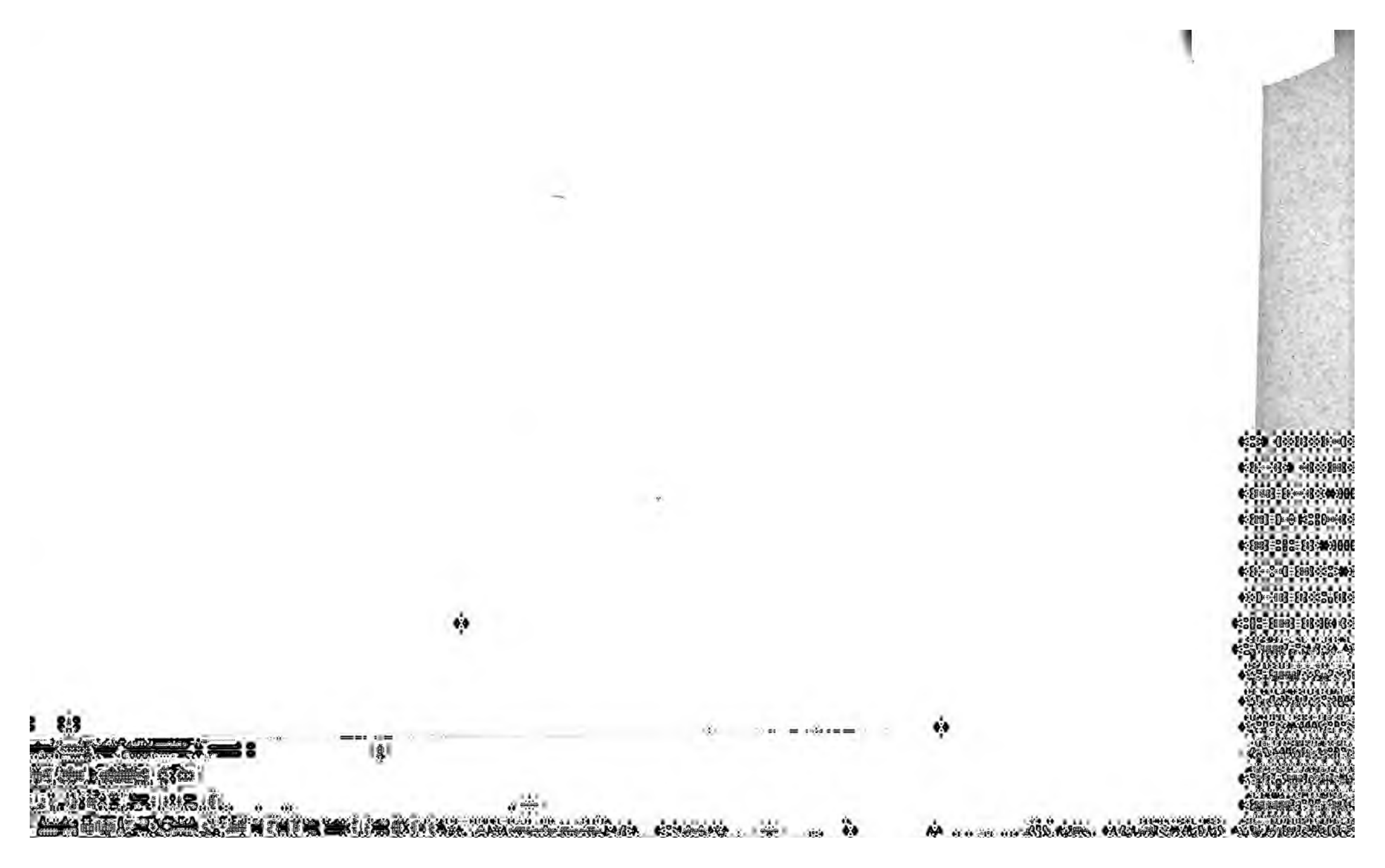
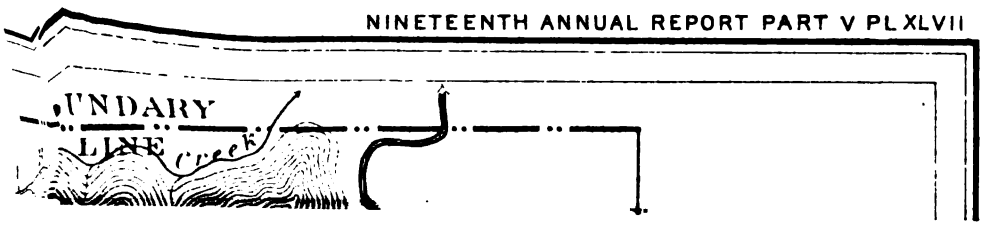
LEGEND
AGRICULTURAL LAND




ADA
TATES
Boundary




LEGEND